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The Kansas Industrial Court

By K. H. CONDIT
Managing Editor, *American Machinist*

It is not the intention of this brief sketch to supply a critical analysis of the new Industrial Court of the State of Kansas. It has not had time as yet to prove itself one way or the other. Other legislatures are considering similar action, however, and consequently a knowledge of the law itself and the steps leading to its adoption will be useful to employers and managers who may soon be called upon to face the problems involved in its application.

"WHEN a dispute between capital and labor brings on a strike affecting the production or distribution of the necessaries of life, thus threatening the public and impairing the public health, has the public any right in such a controversy, or is it a private war between capital and labor?" This is the question propounded to Samuel Gompers by Governor Allen of Kansas in their so-called debate in New York several months ago. Mr. Gompers claimed the question was a catch question and evaded it, his action being generally interpreted as an indication that he considered the right to strike paramount. Governor Allen and the Kansas legislature have taken the opposite view and the law authorizing the Industrial Court is the result. It is not so very different from some other laws dealing with the same subject but it has very business-like teeth and has been very carefully drawn to resist the inevitable attacks upon its constitutionality. Just how it will stand the test of time is problematical and depends to a large extent upon the wisdom of the appointments of the three judges who compose the court.

A word about the conditions that led to the passing of the bill will perhaps throw some light on a situation that has been misrepresented by interested parties on both sides of the fence.

Judge Curran, of the Kansas Supreme Court, in his decision adjudging Alexander Howat, the head of the United Mine Workers in Kansas, guilty of contempt of court in refusing to testify before the Industrial Court, gave a vivid picture of conditions in Kansas in December, 1919, when the coal miners were on strike for a 60 per cent increase in pay, a six-hour day and a five-day week. "We find the state, by reason of being deprived of fuel, in a paralyzed condition in practically all of its industries. The streets of the cities were dark; the schools were closed and education was interfered with; the unfortunates confined in the hospital for the insane, threatened with the hazard of freezing. We find in the school for the feeble minded the same condition. The hospitals that dot the State of Kansas, where the sick, the weak, the crippled, the maimed and helpless were confined, threatened with the hazard of freezing for want of fuel; the school for the deaf and dumb, and the school for the blind and helpless, and every institution in the state, threatened and doubly threatened; transportation paralyzed; the means of distributing food and other necessaries of life did not properly function as a result of not having fuel. Whenever you paralyze transportation you make a strong bid for starvation and suffering. This was at the beginning of winter and without fuel."

The Birth of the Industrial Court

The miners defied the governor to do anything and he promptly replied with the call for volunteer strike-breakers which was answered by ex-service men, students from the state university and other citizens. They had an awful time of it but they mined coal and got things running again. But Kansas had been badly scared and Governor Allen decided it was time to do something to prevent a recurrence of the danger. He called a special session of the legislature to consider the Industrial Court Bill which had been prepared by William Huggins, a member of the old public utilities commission and an excellent constitutional lawyer.

Organized labor, or rather its leaders, took one good look at the new bill and let out an agonized howl of protest. The big employers also took a look at it but said nothing just then. They spoke later.

It is no great wonder that these labor organizers took fright at Governor Allen's bill for they were wise enough to see an early end to their usefulness if this law accomplished what it set out to do. Under the terms of the bill any group of workers may present a grievance to the court for relief, either through their own representative or through the attorney general of the state. Unlike other courts, the industrial court is financed by the state, thus making it available to the poorest laborer.

One of the first moves of the union element probably had a good deal to do with the early passage of the bill. Shortly after the bill had been introduced before the house, Judge Frank L. Martin, who was making an address on the constitutional features of the measure, read a letter which had been sent out by the local lodge of the Boiler Makers' Union at Newton, Kan., a division point on the Santa Fé railroad. The letter included this resolution:

"Resolved, that Local Lodge No. 404 of the International Brotherhood of Boilermakers, Iron Shipbuilders and Helpers of America, of Newton, Kan., do most urgently protest any 'anti-strike' legislation which may be considered at this session, or any other session of the legislature of the State of Kansas, and be it further resolved that we stand true to the dictation of our international officers, and should they order us to protest this legislation, should it be enacted, by striking, or by other means, we would not hesitate to obey their orders."

As might have been expected the letter created a sensation but had quite the opposite of the desired effect. The open threat stiffened the resolution of some of the waverers and only made the passage of the bill a little more certain.

Strong Objections of Labor Leaders

This was only one of many letters sent out by unions, labor leaders and individuals to Governor Allen, to members of the legislature and to the local press. Howat, the radical head of the coal miners' organization, sent out a statement to the unions on Dec. 29 in which he characterized the proposed legislation as the most drastic and vicious bill against labor ever heard of. He also said that its passage meant "absolute slavery for the coal miners and all other classes of labor in the state," and the destruction of "the usefulness and effectiveness of the organized labor movement in the State of Kansas." Most of the usual arguments in favor of the right to strike were also included.

At the same time the governor and some of the legislators received personal letters from members of the unions strongly favoring the bill as "individuals" but stating that they must be against it as members of the unions.

To the outside spectator these letters are significant. It does not require a great stretch of the imagination to see that what the union leaders and organizers feared was an agency that would supplant them in securing justice for the workmen and thus put an end to some very easy "pickings." On the other hand it seems quite as apparent that the more thoughtful of the rank and file of the unions saw a chance to rid themselves of the virtual slavery imposed upon them by union dictation.

Washington headquarters of the American Federation of Labor saw the "danger" of this Industrial Court bill and sent Frank P. Walsh to address the Kansas legislature in opposition to the bill. Mr. Walsh came well-prepared and talked for five hours on Jan. 8 without the least apparent effect. He was followed the next day by J. I. Sheppard, of Fort Scott, whose remarks were equally ineffective.

So far nothing had been heard from capital, but on Jan. 13, when the hearings before the senate judiciary committee were opened, the coal operators, the millers and the Kansas Employers' Association, through their attorneys, appeared to protest against certain features of the bill. The employers were strong for the section of the bill prohibiting the calling of strikes but were equally strong against the one permitting the state to take over essential industries during emergencies and run them for the protection of the public.

Opinion of the Employers

The fluent staff correspondent of the *Kansas City Star* in describing the hearing says, "The objection of the industries that come under the provisions of the measure is that it is 'clearly unconstitutional' in that it declares private industry to be public utilities. It will, according to the employers, drive capital from the state, take property without due process of law, and several other calamities are threatened in its provisions. It is the cat that threatens the industrial cream, the fly in the industrial butter; the bulldog in the state's backyard to chase industry up a tree or drive it over the state-line fence into other fields of operation."

But in spite of hours of fervid oratory and reams of written and printed matter, the two houses passed the bill separately on Jan. 16 and sent it to conference. It was soon patched up and was signed by Governor Allen on Jan. 23.

The governor wasted no time after the bill became a law in selecting his appointees. He met with two or three refusals, among them that of William Allen White who admitted that he was sorely tempted to break his iron-clad rule of never accepting public office, but on Feb. 2 the three judges were sworn in and the same afternoon Attorney General Hopkins filed the first case in behalf of 60 miners who had been locked out for 30 days.

The three judges, shown with Governor Allen in our illustration, are William L. Huggins, framer of the bill; Clyde M. Reed, the governor's former private secretary, and ex-Senator George M. Wark of Caney County.

Outstanding Provisions of the Bill

Apparently much of the adverse criticism of this Industrial Relations Court bill has been based on a very sketchy acquaintance with its provisions, as some of it seems rather illogical when the bill is carefully analyzed.

The court consists of three judges appointed by the governor and approved by the Senate. The term is three years and the salary $5,000 per year. The senior judge presides.

The court supersedes the public utilities commission and takes over all its duties in addition to the new ones provided for in the act.

The industries declared to be affected with a public interest and over which the court has jurisdiction are specified as follows:

(1) The manufacture or preparation of food products whereby, in any stage of the process, substances

are being converted, either partially or wholly, from their natural state to a condition to be used as food for human beings; (2) the manufacture of clothing and all manner of wearing apparel in common use by the people of this state whereby, in any stage of the process, natural products are being converted, either partially or wholly, from their natural state to a condition to be used as such clothing and wearing apparel; (3) the mining or production of any substance or material in common use as fuel either for domestic, manufacturing, or transportation purposes; (4) the transportation of all food products and articles or substances entering into wearing apparel, of fuel, as aforesaid, from the place where produced to the place of manufacture or consumption; (5) all public utilities as defined by Section 8329, and all common carriers as defined by Section 8330 of the General Statutes.

Section 7 of the act, stripped of its legal verbiage, states that in the case of a controversy which seems likely to endanger the functioning of one of the abovementioned industries, the court may hold an investigation to settle and adjust this controversy. Also that either party to the controversy or any ten taxpayers may appeal to the court to hold such an investigation. Section 8 gives the court authority to order changes in the industry under its jurisdiction in the matters of working and living conditions, hours of labor, rules and practices, and a reasonable minimum wage or standard of wages, provided such changes are fair to labor, to the industry and to the public. Either party to such a change may apply for relief if the order is found unjust, unreasonable or impracticable after a fair trial of sixty days or more and the court is then required to reopen the case.

The next section concedes the right of capital to a fair return on the investment and the right of workers to a fair wage and healthful and moral surroundings while working. It also recognizes the right of every person to choose his occupation and to make and carry out fair and reasonable contracts in connection with it.

In Section 11 the court is authorized to proceed against any person who refuses to obey its summons or subpœna, in any court having jurisdiction. At the time this is written, Alexander Howat is out on bond for refusing to testify before the court in one of its investigations. The case was decided against Howat in the Kansas Supreme Court and was appealed to the United States Supreme Court. Section 12 permits the court to proceed against either party to a controversy upon its refusal to obey the orders of the court, in the Kansas Supreme Court and also permits either party to appeal to the Supreme Court if it feels itself aggrieved. Such cases in the Supreme court take precedence over other civil cases.

Because of its importance, Section 14 is given in full: "Any union or association of workers engaged in the operation of such industries, public utilities or common carriers, which shall incorporate under the laws of this state shall be by said Court of Industrial Rela tions considered and recognized in all its proceedings as a legal entity and may appear before said Court of Industrial Relations through and by its proper officers, attorneys or other representatives. The right of such corporations, and of such unincorporated unions or associations of workers, to bargain collectively for their members is hereby recognized: Provided, that the individual members of such unincorporated unions or associations, who shall desire to avail themselves of such right of collective bargaining, shall appoint in writing some officer or officers of such union or association, or some other person or persons as their agents or trustees with authority to enter into such collective bargains and to represent each and every of said individuals in all matters relating thereto. Such written appointment of agents or trustees shall be made a permanent record of such union or association. All such collective bargains, contracts, or agreements shall be subject to the provisions of Section 9 of this act."

Section 15 declares it to be illegal for either employer or employee to discriminate in any way against any member of the other party to a controversy because of any action connected with the operation of the court such as testimony, appeals for investigation, etc.

The willful restriction or limitation of service or output of the essential industries is declared unlawful in Section 16, but provision for an appeal to the court for permission to limit output or service is made to take care of possible emergencies.

Section 17 makes it unlawful for any person, firm or corporation, or for any association of persons, "to disobey the orders of the court in relation to the hindrance of the essential industries, provided "that nothing in this act shall be construed as restricting the right of any individual employee . . . to quit his employment at any time." This section goes on to say that conspiracy with other persons to quit their employment or to induce others to quit, to indulge in "picketing" or to intimidate any persons with the intent to make them quit work or to prevent them from accepting work is unlawful.

Section 18 makes violation of the provisions of the act a misdemeanor punishable by a fine of $1,000, imprisonment in the county jail for one year or both.

Section 19 goes after officials of corporations or labor unions or associations who may use their authority to cause others to violate the provisions of the act; in other words, to declare a lockout or call a strike. Such an action is a felony punishable by $5,000 fine, two years at hard labor in the state penitentiary or both.

Section 20 contains the provisions most seriously objected to by the employers. Here it is: "In case of the suspension, limitation or cessation of the operation of any of the industries, employments, public utilities or common carriers affected by this act, contrary to the provisions hereof, or to the orders of said court made hereunder, if it shall appear to said court that such suspension, limitation, or cessation shall seriously affect the public welfare by endangering the public peace, or threatening the public health, then said court is hereby authorized, empowered and directed to take proper proceedings in any court of competent jurisdiction of this state to take over, control, direct and operate said industry, employment, public utility or common carrier during such emergency: Provided, that a fair return and compensation shall be paid to the owners of such industry, employment, public utility or common carrier, and also a fair wage to the workers engaged therein, during the time of such operation under the provisions of this section."

The court is still very young and its ultimate success is of course in doubt. The employers have accepted this situation and are giving the law a fair trial with the hope that it may provide the solution of the labor troubles of Kansas.

Unfortunately the same cannot be said for the labor leaders. As was stated before, the head of the United Mine Workers refused to testify in an investigation into conditions in the coal fields conducted by the court, and is now out on bond pending the decision of the Supreme Court of the United States.

In his remarks before the Chamber of Commerce of the United States at Atlantic City last spring, Governor Allen made the statement that up to that time the court had done more to improve the condition of the mine workers of Kansas than had organized labor in twenty years. Of the twelve cases decided up to that date, eleven had been in favor of the men, a record which has probably done much to convince the doubtful ones that their interests would be taken care of.

The constitutionality of the act creating the court has been upheld by the Supreme Court of Kansas and the vast majority of the people of the state are for it, as shown by the large majority by which Governor Allen was renominated at the primaries. Many other state legislatures are seriously considering the enactment of similar legislation and several have sent special investigators to get complete information on the problems encountered and the results obtained.

The machine industry does not rank with the essential industries denominated in the Kansas act and consequently will not be directly concerned with the provisions of the Kansas law or any similar ones passed by other states. The indirect effects, however, are important for what manufacturer would not benefit by the elimination of the strike blight on transportation and the production of coal? Therefore it behooves employers to be familiar with this effort to provide a substitute for the wasteful strike method of settling controversies between labor and capital, in order to be prepared to meet the problems which are sure to follow when the industries of their own state become subject to similar regulation.

Fixture for Milling an Ellipse

By P. A. FREDERICKS

The necessity of milling small elliptical shapes on a production basis caused the making of this fixture, by the use of which ellipses are milled without the use of a dividing head. The writer states that the form of the work produced approximates an ellipse very closely, although it may not be a true ellipse.

WHEN an elliptic shape requires finishing as a manufacturing proposition, something other than that old stand-by, the master cam, has to be provided, for the percentage of rise on some points of the surface is altogether too great to allow the mechanism to work properly.

Ellipses can easily be turned on a lathe, either the work or the tool being caused to reciprocate to trace the proper outline as the work revolves. Such methods, when applied to milling, are considerably complicated by the interference with the work of the teeth around the periphery of the cutter, the cutting action being different from that of the single-pointed lathe tool.

The writer was recently shown an arrangement in which the cutter interference was actually taken advantage of to help produce the elliptical form, and the device was so simple and effective that it seems worth passing on. Figs. 1 and 2 show, respectively, a front view of the device mounted on the milling machine table, and a vertical side section.

The action is as follows: A knuckle shaft *A*, driven from the feed box of the milling machine, drives an eccentric shaft *B* through a worm and worm gear and a clutch *C*, used for tripping the feed. Rotation of the eccentric causes the pivoted table *D* to move up and down under the cutter *F*, the throw of the eccentric being just half the difference between the large and small axes of the ellipse it is desired to cut. The work *E* is suitably clamped, as shown, under the cutter *F*, and it is geared to the eccentric shaft to revolve once for each two revolutions of the eccentric *B*.

The feed trip pin *G*, adjustably mounted in a tee-slot in the driving gear on the work spindle, trips the clutch *C* and stops the cut by operating against the pivoted lever *H* when one revolution of the work has been completed. The milling machine table is then run to one

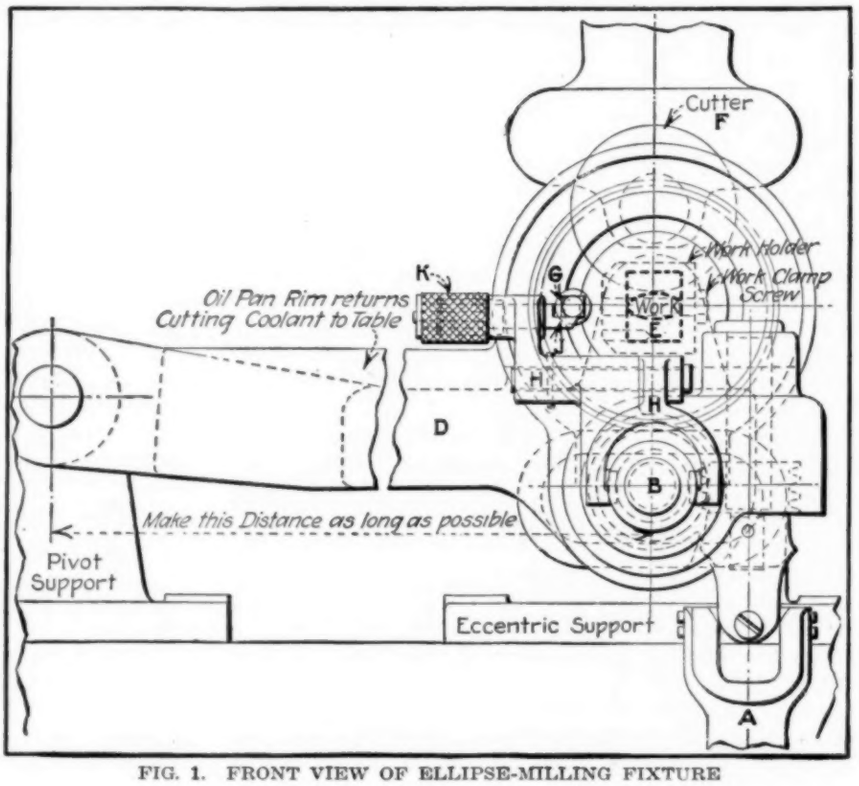

FIG. 1. FRONT VIEW OF ELLIPSE-MILLING FIXTURE

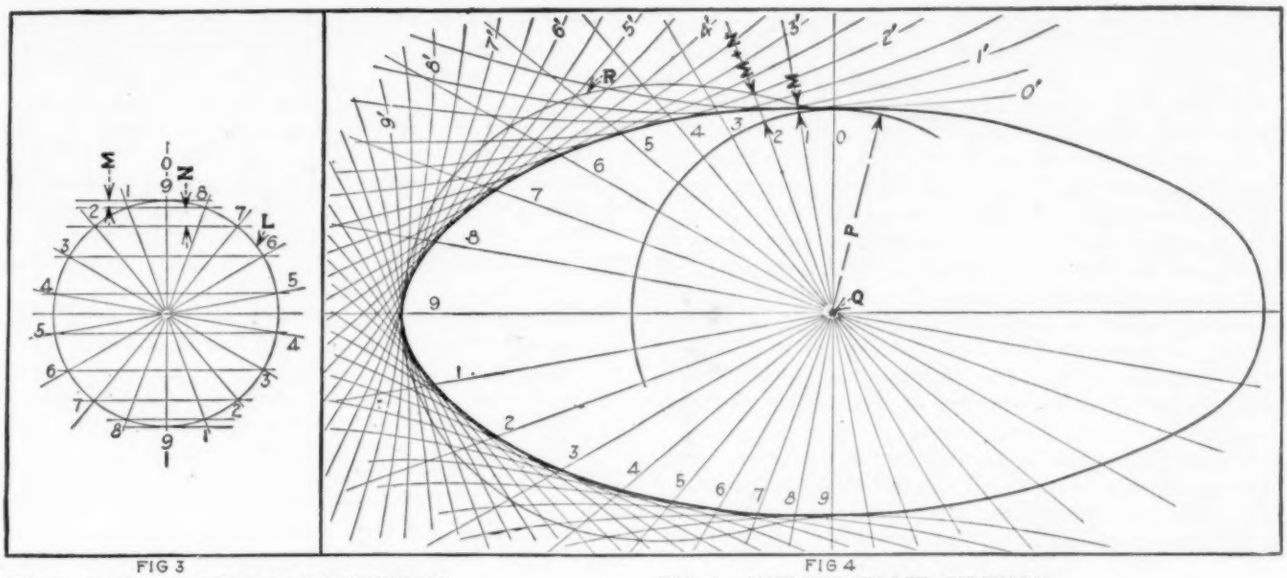

FIG 3 FIG 4

FIG. 3. PATH OF CENTER OF ECCENTRIC

FIG. 4. OUTLINE MILLED ON WORK

side and fresh work inserted, after which the table is run back against a stop and again clamped in the position shown. In order that the automatic feed can be started again at the exact zero point, the pin *J*, which trips the clutch when struck by pin *G*, can be withdrawn by the knurled knob *K*, and the clutch *G* again engaged.

The forming action and the resulting ellipse are shown in Figs. 3 and 4. In Fig. 3, the circular path *L* of the eccentric center is divided into sections marked *0*, *1*, *2*, etc., and representing a movement of 10 deg. on the work. Spaces *M*, *N*, etc., then, represent the movement of the work away from the cutter.

Lines *0*, *1*, *2*, etc., in Fig. 4, represent 10 deg. of movement of the work. Assume that the cutter is originally set at a distance *P* from the center *Q* of the work axis (when work and eccentric are in positions represented by the zero lines). Then, the outline which would be formed, if the eccentric and the work were set in motion and if the cutter were a single point, is represented by curve *R*, obtained by adding to the radius P, Fig. 3, the distances *M*, *MN*, etc., along the lines *1*, *2*, etc. (Fig. 4).

However, owing to the circular shape of the cutter, the form of *R* is partly cut away as the work revolves, the shape which is left being determined by drawing in the cutter outlines (lines *0'*, *1'*, *2'*) for the various positions of the work. The position of the center of the cutter for each position of the work is found by laying off the cutter radius along the various radial lines, *1*, *2*, etc., from the point where the line *R* intersects them. The resulting shape left on the work, as will be seen from Fig. 4, is an ellipse.

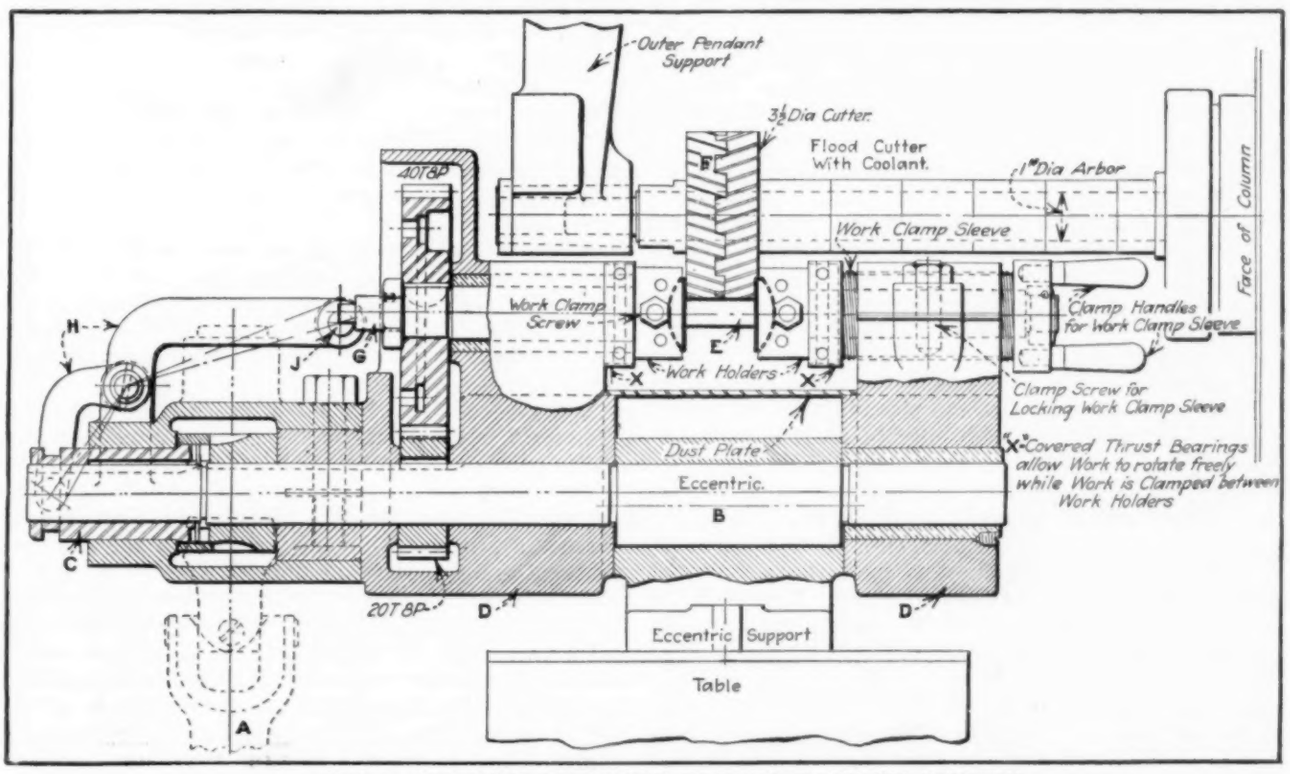

FIG. 2. SECTIONAL ELEVATION OF ELLIPSE-MILLING FIXTURE

There is a very nice problem here for some one with a mathematical turn of mind to prove that the outline thus formed is or is not a true ellipse. The writer has concluded that it is not, because the outline produced must vary slightly with different cutter diameters. Since only one outline could be a true ellipse, it is extremely unlikely that any cutter diameter would exactly produce an ellipse. However this may be, the outline in Fig. 4 comes so close that it apparently coincides with an ellipse laid out according to accepted methods. The variation in the outline caused by changing the cutter diameter makes so little difference that it is not apparent between 3½ and 5-in. cutters on a layout of 10 to 1 scale, though the outline would probably approach line *R* quite rapidly as the cutter diameter approached close to zero.

The above method originated in the customers' engineering service department of the Kempsmith Manufacturing Co., Milwaukee, Wis., for use on one of the milling machines built by that firm.

Know Your Sprinkler Valves

By L. L. Thwing

Some years ago a fire started in the stockroom of the plant where I was employed and various things happened that are likely to happen in almost any shop. In the first place the watchman had no key to the stockroom, as there was no station there for him to ring in on, with the consequence that the fire had quite a start when the water from the sprinkler heads, running out under the door, attracted his attention. It was Sunday morning about church time and it was only after some trouble that the watchman was able to get the storekeeper on the telephone. In the meantime the fire department had forced the door and found the fire had been extinguished by the sprinklers. The storekeeper and assistant superintendent arrived within a short time and their first thought was to shut off the sprinklers, which were going at full force over the stock of finished parts and the file rack. But when it came to doing it nobody knew where the valve was. The engineer was away in his flivver, so that source of information was not available. After shutting off all the valves in sight, together with the indicator posts that controlled the entire building, the flow was finally stopped but not before considerable damage had been done by the water, which in addition to doing damage in the stockroom had gone through to the sheet iron shop on the lower floor. As soon as the engineer could be located and rush back to the shop he pointed out the proper valve. It was located under a bench and had one or two tons of castings piled in front of it.

Last winter I was in a large plant in the middle west and had an excellent opportunity to observe how accidents happen to confirm my belief that the average shop, for one reason or another, is not able to shut off the sprinkler heads as promptly as it should. This company used a number of portable, oil-fired rivet furnaces. The oil supply was in the base of the forge, a tank that would hold at least a half-barrel of oil. The oil in the tank had been exhausted, and the sweeper had been told to fill it from the barrel in the adjacent oil house. The oil was brought to the forge in pails and emptied into the tank through a globe valve in the top. One or two pails had been thus emptied and the man was on his way to the oil house for another, when someone who wanted to use the forge came along and throwing a burning piece of waste into the furnace turned on the compressed air. The air found vent through the open globe valve and carried enough of the oil with it to make a very pretty blaze. The man who had started it was of course covered with the burning oil and started to run, but had gone only a few steps when he was felled by a blow over the head with a piece of 2 x 4 wielded by a quick-witted workman, who then turned the fire extinguisher on him.

The oil burned out in a few minutes and then came the question of shutting off the sprinklers. There was a great running around but nothing happened. An attempt was made to shut off that section of the building at the indicator post in the yard, but it was found that the valve had rusted so firmly in its seat that it could not be moved. In fact the riser was loosened at the tee by the torsional effort and began to leak badly. The flood was finally stopped, how I do not know, as I did not think it expedient to ask too many questions.

Do your night and day watchmen all know where the shut off valves for your sprinkler system are located, and do they know just what each one of them controls?

Scheduling Jig, Fixture and Repair Work

By Henry Lee

Scheduling of such work as is found in making and repairing jigs and fixtures should be done in the shop. To follow up orders in the shop many and various systems have been adopted. The one that I find works out the best is as follows:

A card tickler is made up of plain white cards 3 x 5½ in., the index being numbered from 1 to 31, representing days in the month. As an order is scheduled its estimated finishing date is recorded on one of the cards and the card is filed under that date. As an auxiliary to this tickler there is used a piece of white cardboard 12 x 20 in. ruled into 31 parts to represent the days of a month.

Each order coming into the plant is recorded upon the 12 x 20 in. sheet in a space representing its starting date. This sheet is referred to every day for new orders.

Immediately a holdup or interference, as it is called, occurs on account of hardening, models, samples, change in design or anything else, a horizontal red line is placed at the side of the order number and when the interference is cleared a vertical blue line is drawn through the red one. After clearing up an interference the job is rescheduled.

At the end of each month all orders having interference, or red lines, that have not been cleared by blue lines are carried into an interference column on the cards, written with red ink. As the interference is cleared a blue line is drawn through and the order is rescheduled.

Interferences are usually of two kinds, "local" and "foreign." A local interference is one originating in the shop and it is up to the schedule clerk to remove it. A foreign interference is one that is beyond the shop's control. Three copies of a report on a foreign interference are made. One copy is held in the shop and two sent to the main scheduling office, which retains one and forwards the other to the firm or individual responsible for the hold up, who in turn informs the scheduling office concerning the date when the interference will be cleared. The order is then re-scheduled from that date. In the meantime the originator of the order is notified of the re-scheduled date and governs his work accordingly. When an order is re-scheduled it is so indicated by a red R placed at the right of the order number.

SEVEN CENTURIES of BRASS MAKING

By O. A. KENYON
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STUDIES of the most ancient and primitive ruins indicate that the metallurgy of copper, tin and iron was practiced in its crudest form in the earliest periods of man's development. Of these three metals, copper, on account of the ease with which it is smelted, refined, and worked, was probably the first to be used. There is no definite proof of this except that so far as historic times are concerned, although iron was known, copper and bronze were in common use long before iron. Neither the name of the man who discovered the reduction of copper by smelting nor the method he employed will ever be known because he lived long before men began to make records of their discoveries and doings. We have, however, some evidence of prehistoric metallurgy in the many "founders' hoards" or "smelters' hoards" of the Bronze Age which have been found in Western Europe. These hoards indicate that in those days charcoal and ore were burned in a simple shallow pit in the ground and the fire continued until the copper was melted; then it was allowed to cool in the bottom of the pit, forming a rough round cake of from 8 to 10 in. in diameter. Another indication of prehistoric metallurgy is the fact that copper from this period analyzed by Professor Gowland and others shows a small percentage of sulphur, signifying that the copper was derived from smelting oxidized ores.

I. Historic Notes

This series constitutes a brief history of the ancient art of making brass and its early (and even recent) method of production, contrasted with that of the electric furnace process, a twentieth-century achievement. Part I relates the chief authenticated historic facts, from the fourth dynasty (3800-4700 B. C.) to comparatively recent times.

Prehistoric Evidences

Copper objects appear in the pre-historic remains of Egypt. In fact, they were common throughout the first three dynasties, and bronze articles have been found that date from the fourth dynasty (from 3800 to 4700 B. C. according to the authority adopted). In Egyptian hieroglyphics the crucible is the emblem of copper, which would indicate that crucibles were used for refining. The earliest source of Egyptian copper was probably the Sinai Peninsula, where crucibles have been found in ruins. There, too, are found reliefs dating as far back as the time of Senefern (about 3700 B. C.) indicating that he worked the copper mines. Our knowledge of Egyptian copper metallurgy is limited to deduction from metal objects found, and to a few pictures of crude furnaces and bellows, which, however, indicate a considerable advance over the crude hearth method.

The remains of the Mycenaean, Phoenician, Babylonian, and Assyrian civilizations stretching over a period from 1500 to 500 B. C. have yielded endless copper and bronze objects, the former of considerable purity and the latter of fairly constant proportion of from 10 to 14 per cent tin.

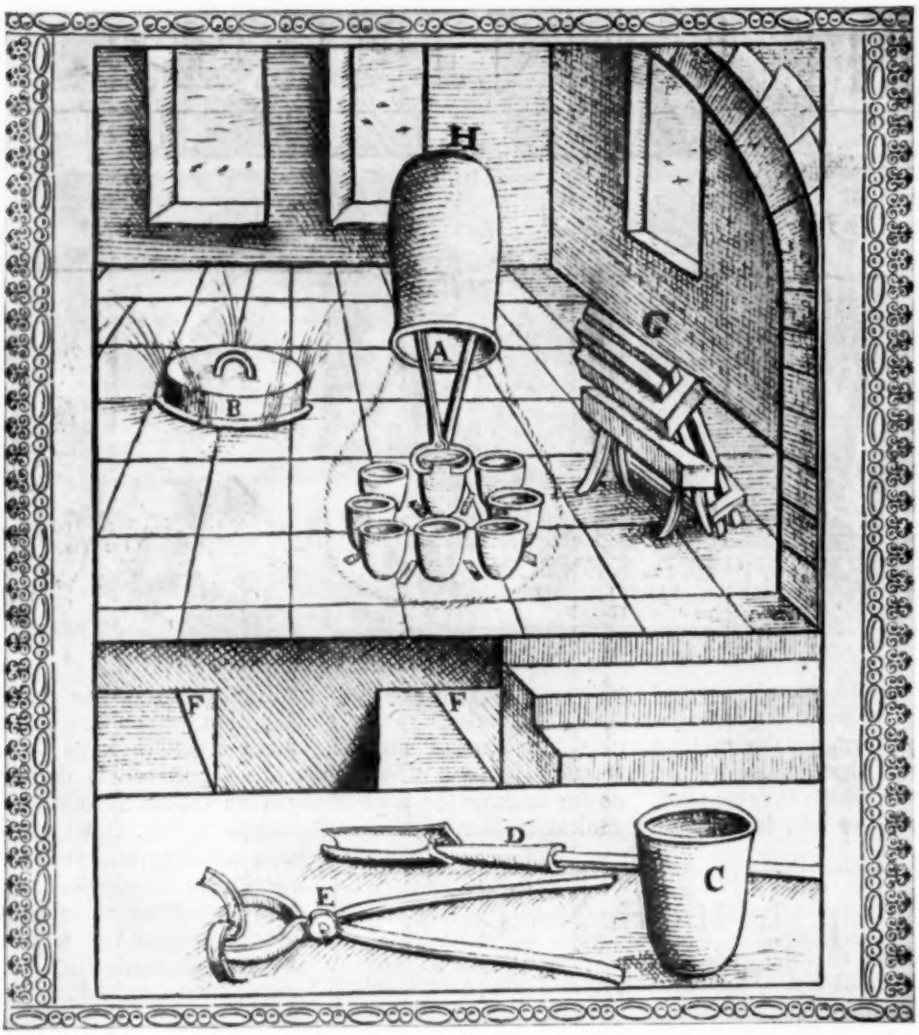
Copper

Apparently the first copper used by the ancient people came first from Sinai and then later from Cypress. Research in Cypress shows that it produced copper from 3000 B. C., and largely because of its copper it passed successively under the domination of the Egyptians, Asyrians, Phoenicians, Greeks, Persians and Romans. Our word "copper" was derived by the Romans, shortening aes cyprium (Cyperian copper) to cuprum.

Tin

As to the tin used in the bronzes, there is some difference of opinion as to its origin. Professor Gowland, for instance, believes that the early bronzes were the result of direct smelting of stanniferous copper ores. However, there is considerable evidence to the effect that this was not true of the Egyptian and other ancient bronzes. As to the source from which the tin was

*Booklet published by the Bridgeport Brass Co., Bridgeport, Conn.

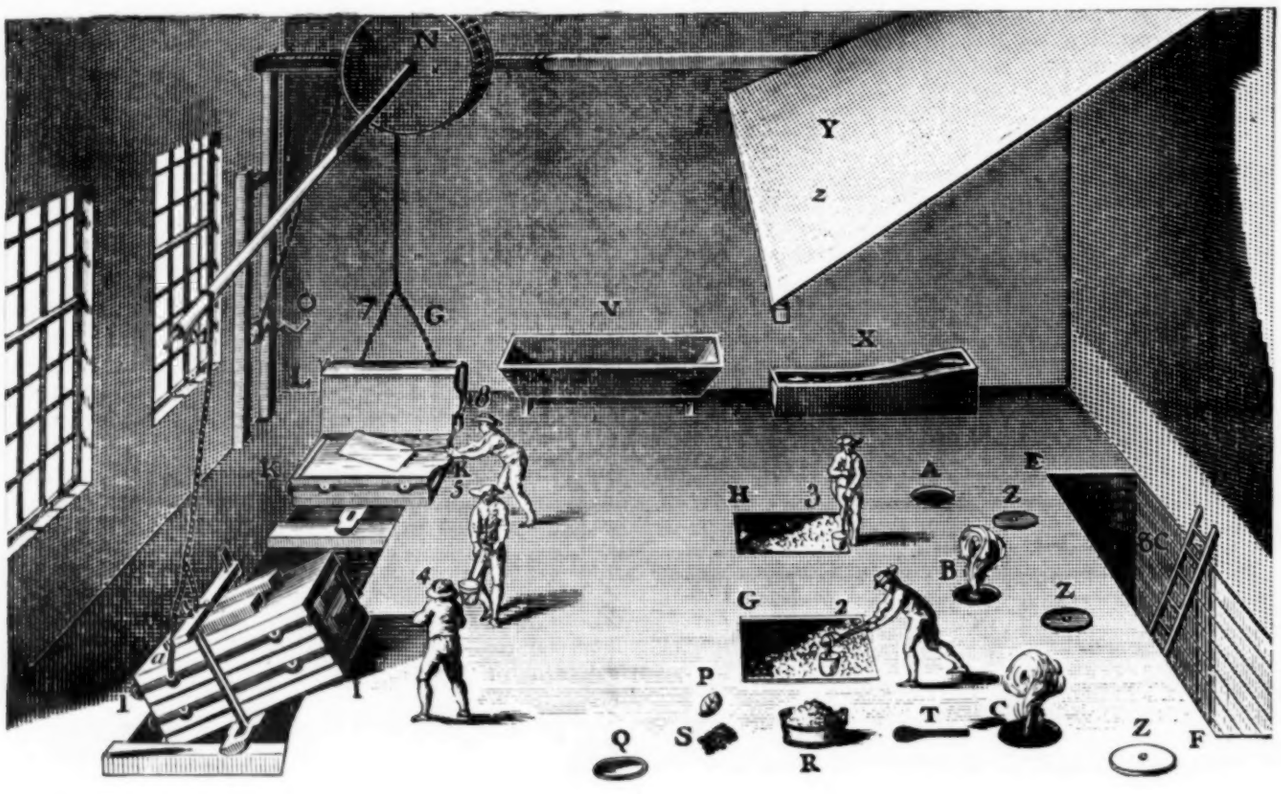


obtained, Spain and Great Britain were used by the ancients. In fact, the name Britannic Isles is derived from the two Phoenician words, *breta-nac*, meaning land of tin.

The early history of brass itself is much beclouded on account of the fact that brass is often confused with bronze and other copper alloys. There are a great many references to brass in the Bible which are undoubtedly due to faulty translation, either bronze or copper being meant. For instance, Rev. John Hodgson, in a paper published by the Society of Antiquaries, Newcastle-upon-Tyne, in 1822, and entitled "An Enquiry into Aera When Brass was Used in Purposes to Which Iron is Now Applied," said: "In tracing the connection between ancient implements of brass discovered in Britain and the mercantile people along the

FIG. 1. (UPPER) BRASS FOUNDRY
Illustration taken from Ecker's *Unterердische Hofhaltung*, page 261, published in 1672

FIG. 2. (LOWER) INTERIOR OF A FOUNDRY IN COUNTY OF NAMUR ON THE MEUSE
Illustration from paper by Galon before the Academie Royale Des Sciences, 1764



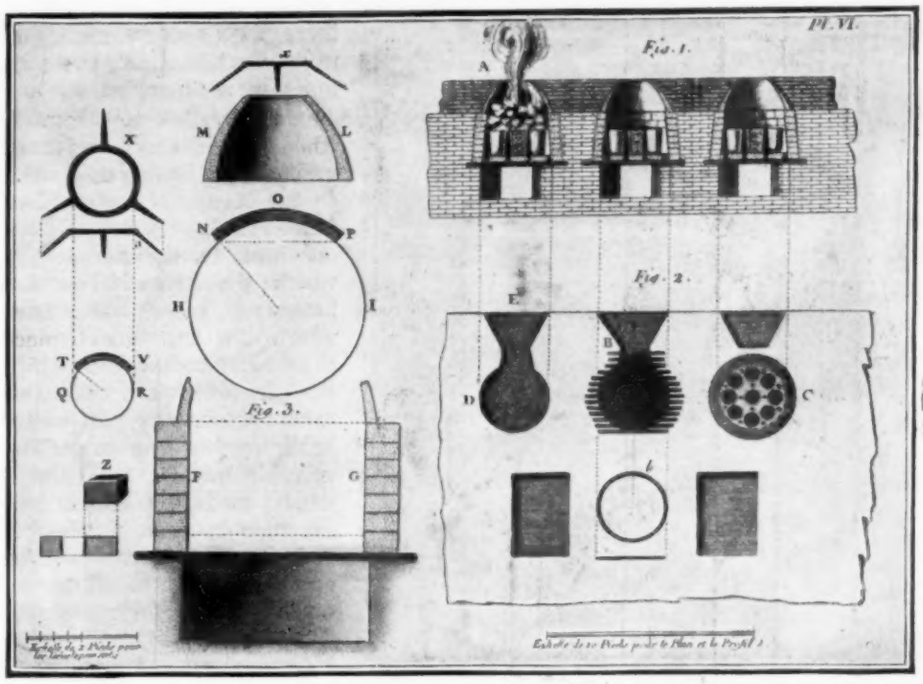


Illustration from paper by Galon before the Academie Royale Des Sciences, 1764
FIG. 3. BRASS MELTING FURNACE CONSTRUCTION

shores of the Mediterranean Sea, it will be necessary to direct our attention to the information which the ancients have left us concerning their knowledge of tin, which is by far the most common of all the alloys which they used with copper in making brass. This would indicate that even in his time there was confusion in the designation of brass as we understand it today.

The earliest accounts of brass making describe the use of calamine (a zinc ore) with copper and it is not until the eighteenth century that the practice of making brass with metallic zinc came into use. Zinc as a metal was known in the Far East long before the Europeans had succeeded in separating it from its ores, and it was imported from the East in considerable quantities as early as the sixteenth and seventeenth centuries. Spiauter, from which our term "spelter" was derived, is one of the names under which Easterners marketed zinc.

Although brass objects dating back to pre-historic times have been found, and many references are made to brass in the earliest literature the confusion of terms makes it impossible to be certain that brass is meant. The first unmistakable reference to brass in literature is made by Dioscorides in the first century; and the first accurate technical description of brass making does not appear until the thirteenth century, when Theophilus described the calcining of calamine and its mixture with finely divided copper in glowing crucibles. This process was described many times subsequently, and was in general use, substantially as described by him, down to the eighteenth century.

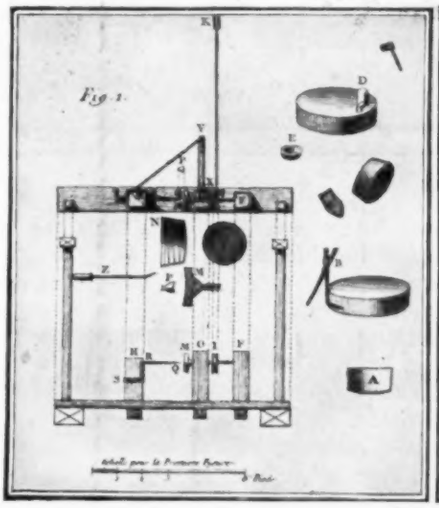


FIG. 6. MACHINE FOR FINISHING BRASS KETTLES

FIG. 7. MACHINE FOR SHEARING BRASS STRIPS

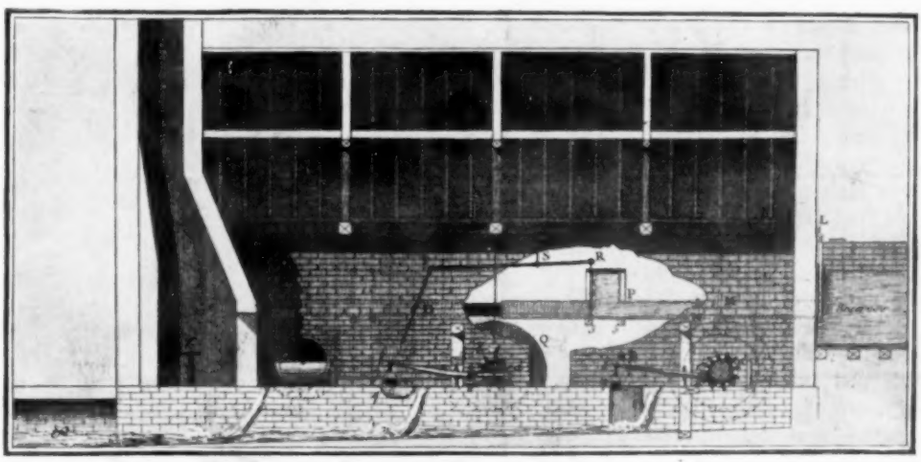


FIG. 4. ANCIENT FORGING PLANT OPERATED BY WATER POWER

The earliest picture of brass making equipment that we have been able to locate is reproduced in Fig. 1 from Ecker's *"Untererdische Hofhaltung,"* page 261, published in 1672. According to the author's description, which is

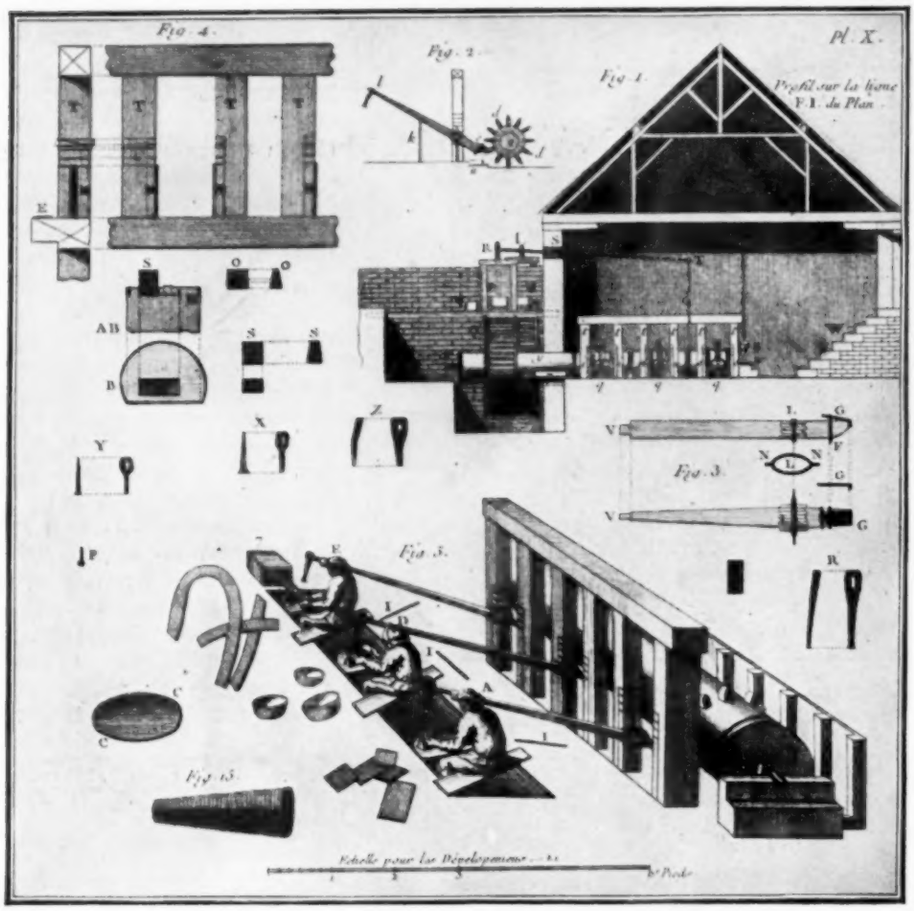


FIG. 5. DETAILS OF BRASS FORGING PLANT AS SHOWN IN FIG. 4

very meager, calamine and fine coal were mixed together, with water and salt added. After heating the pots, 46 lb. of calamine were divided among eight pots, and then 8 lb. of copper were put in each pot. The heat was applied for 9 hr., when the mixture was well stirred, and then allowed to stand for an hour, when it was poured into a mold made of Britain stone, so called because it was imported from Great Britain. Though this book was printed in 1672, the process it describes is the same as revealed by Theophilus, four centuries before. Referring to the figure, *A* is an interior view of a brass furnace, showing the arrangement of the crucibles and how they are set in place; *B* the furnace in action; *C* the crucible; *D* a shovel for the calamine; *E* a pair of tongs for handling the crucibles; *F* the draft opening of the furnace; and *G* a mold made of British stone. *H* represents the master caster.

A very much better illustration of a brass foundry of this type is contained in an article by Galon, printed in 1764 in Volume V of the *Proceedings of the Academie Royale des Sciences*. In this article Galon described the art of brass making as practiced at that time. This was followed by two other contributions in the same volume, one by Swedenborg which covered briefly the practices of the various countries of Europe, and another by M. Duhamel du Monceau who described in detail the equipment and operation of a works in Ville-Vieu. These three articles, together with beautiful illustrations, give a very complete technical description of brass founding work as carried on during the seventeenth and eighteenth centuries.

According to Galon, foundries were built in units of three furnaces each, and usually not less than two such units were involved in any single installation. Fig. 2, which shows the interior of a foundry in County of Namur on the Meuse, is explained as follows: *A*, *B* and *C* are openings to the furnace in which the crucibles are heated; *E* and *F* space from which the fires are tended; *G* and *H* receptacles in which the crucibles are skimmed (the skimmings afterward being worked over to reclaim valuable metal); *I*, *K* and *L* molds made by stone, held together by iron frames; *N* and *O* parts of the hoisting equipment for handling the molds; *R* tub for measuring calamine; *S* small pieces of copper about 1-in. cube; *T* paddle used for mixing and handling the calamine; *V* tub in which calamine and pulverized charcoal are mixed; *X* bed, of which there are three in each foundry, as the founders stay on the job 24 hr. for five days in the week; *Y* apron for catching gases from the skimming pots and the furnaces and leading them to the chimney flue; and *Z* covers to the melting furnaces.

Pulverized charcoal and calamine were mixed in the

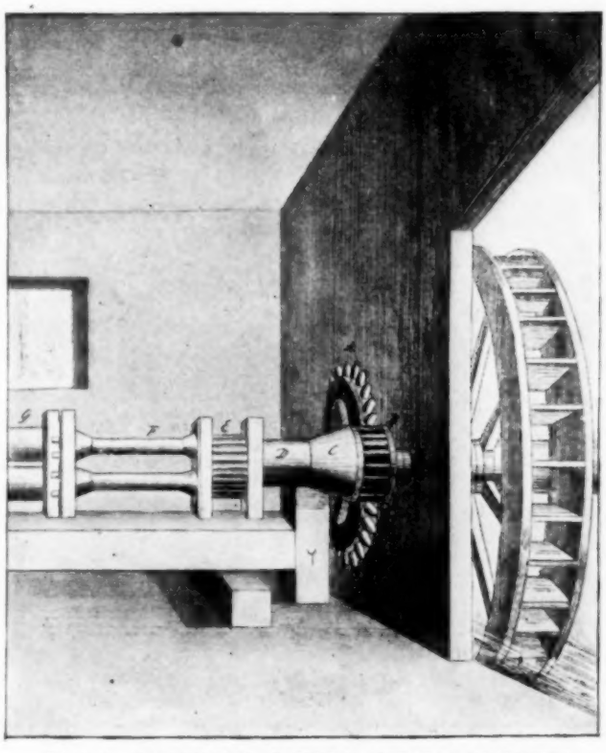


FIG. 8. ROLLS FOR COPPER AND BRASS SHEET

large tub, and inserted in the crucibles from the small tub by means of the mixing paddle. Copper was used in the form of small cubes, or in small balls or shot, as in this way a more intimate mixture could be made with the calamine. Having melted the charge, the crucible is removed from the furnace and skimmed in one of the pits. The man at *3* is skimming one of the crucibles while the man at *2* is pouring the contents of the crucible into a larger crucible which was used as a ladle. After the contents of the various melting crucibles had been skimmed and poured into the ladle, two men with special tongs, carried the ladle and poured its contents into the mold while the latter was in the position at *1*. As soon as the pouring was completed the mold was hoisted to a horizontal position, the fastenings undone, and the upper part hoisted. The workman *8* is seen removing the slab of brass from the mold.

The furnaces are fired from the pit, each furnace containing eight or nine crucibles, as shown in Fig. 3.

The principal difference between these furnaces and the modern pit furnace is the method of taking care of gases of combustion. Here they were allowed to pass on through the top of the furnace into the casting shop, where they were caught under a large apron which led them into a common flue; while in the modern furnace the gases are led through the side of the furnace directly into the flue. The stirring of crucibles in furnaces such as these must have been an extremely disagreeable task.

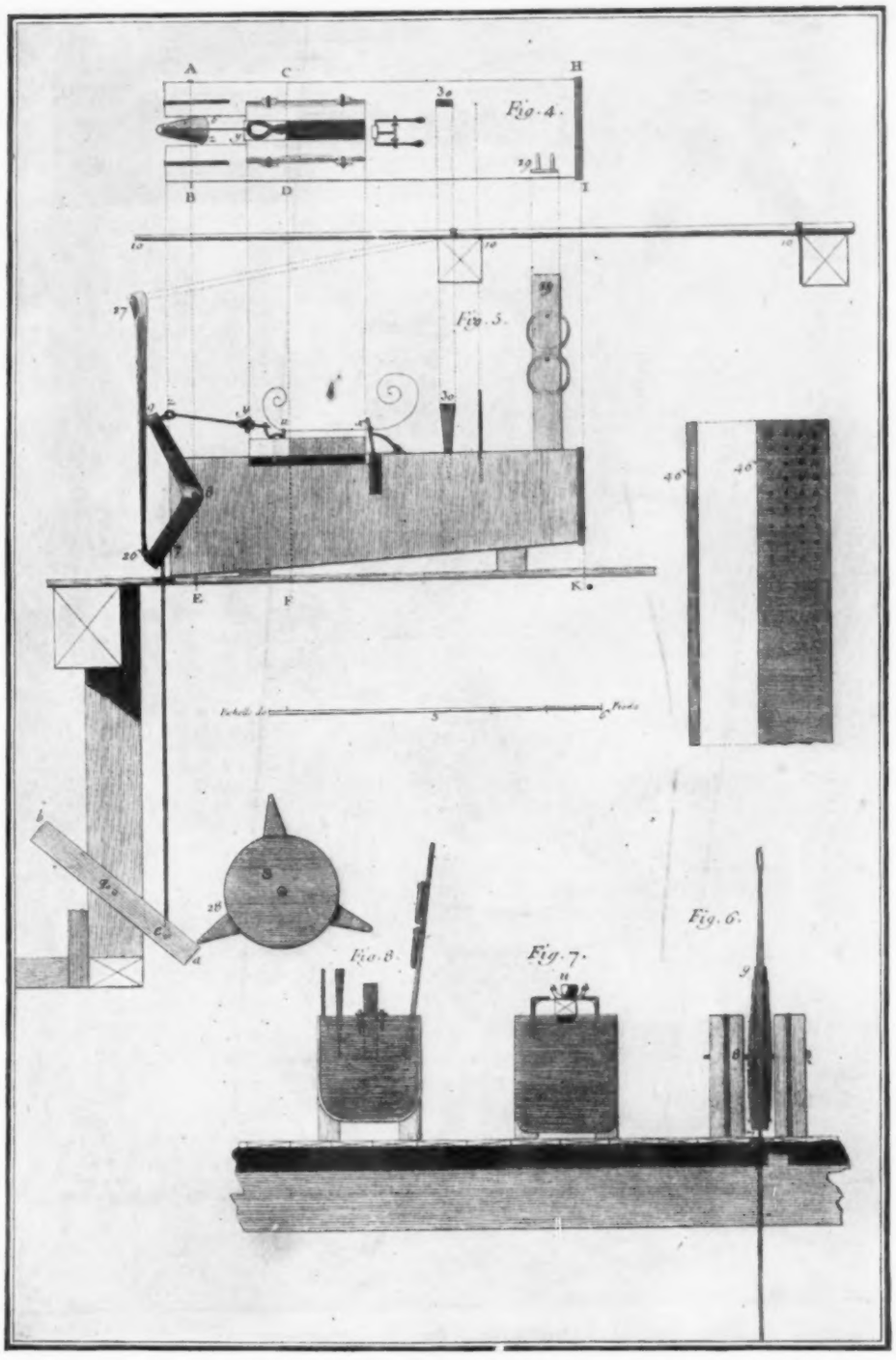


FIG. 9. DRAW BENCH FOR WIRE-DRAWING

Those familiar with present practice in brass making will be struck by the remarkable resemblance of methods employed by these early brass makers to the ones in use today. Our modern pit furnaces are constructed for more efficient combustion, but in principle they are similar to the ones shown in Fig. 3. Compare these old practices with present day practice as shown by Figs. 13, 14 and 15. Although no smoke or fumes such as seen in these pictures are shown in the old illustrations, the fact that they were there is attested to by the following quotation from Galon: "The doors and windows of the foundry are kept tightly closed while pouring. The workmen hold the ends of their neckties between their teeth when they skim or when they carry or pour metal. By this precaution they diminish the effects of the fire and facilitate respiration."

Incidentally, the labor conditions existing at that time are extremely interesting. It is stated that there were three couches similar to the one shown at *X*, Fig. 2, in each foundry, for the use of the workmen, as they spent the whole twenty-four hours of five days each week in the foundry, having Saturday and Sunday off. Quoting from Galon, "the ordinary hours of work are: Pouring the slabs between 2 and 3 o'clock in the afternoon. The crucibles are put into condition and the fires started at 5 o'clock in the afternoon. At 10 o'clock in the evening the fires are replenished and the second

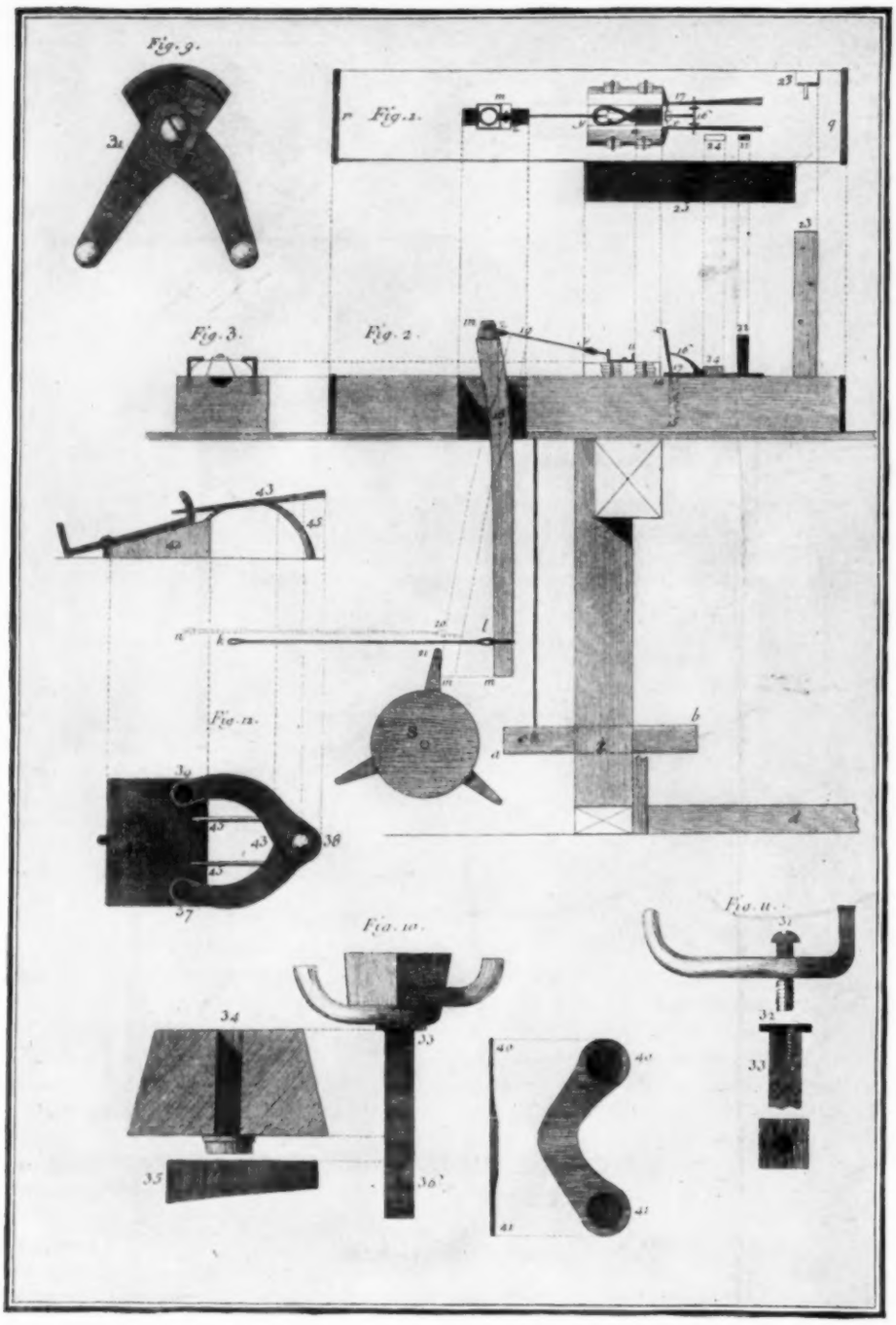


FIG. 10. ANOTHER FORM OF DRAW-BENCH

pouring is made at 2 or 3 o'clock in the morning. In other words, a complete operation requires 12 hours."

According to Galon there were three workmen in each foundry—a master founder and two assistants—and the work was so laid out that when operations were to be performed which required more than three men, help could be obtained from one of the other foundry units. As far as the pay was concerned the assistants received about 12 cents for a day of 24 hr. work. They were also supplied with beer, which was considered to be a necessity for all foundry men, and coal for heating their dwellings was furnished to them.

Evidently master founders were paid on the production basis because Galon says: "It is estimated in 1748 and during the war that the master founders earned, after expenses were covered, 4 florins for each slab of 85 pounds." With regard to the skill necessary, Galon says: "Work in a foundry demands continual care in order to feed the fires and maintain the necessary degree of heat for casting." He also mentions the various duties in connection with the care of the molds and disposition of the product, all of which fell upon the master founder.

Duhamel du Monceau, previously mentioned, refers to the skill required as follows: "The founders learn by long practice to care for the fires of the furnaces and to know when the material is in proper fusion and ready for casting." . . . "The skillfulness of founders consists in knowing the mixture and above all knowing the degree of heat which it is necessary to give. In order to be more certain they take, with a small ladle, a portion of molten metal and throw it on a stone and when this thin layer is cold then hammer it. If it breaks they continue the fusion or add a little Flanders scrap. If they use too much heat, the metallic part of the calamine which is zinc will be dissipated and there will remain only brittle metal which will break before it will stretch."

In attempting to explain how to judge when the metal is ready to pour, Duhamel du Monceau says: "The color of the flame indicates the material is in fusion. At first it is red as in ordinary forges. It becomes blue when the scrap is in fusion. then after a short time it becomes clear, in which state it is ready to pour. One also determines the state of fusion by plunging into the metal a stirring rod. When the metal runs to the end of the iron, the material is in condition to be poured."

From the illustrations and the meager descriptions of technique that are available it is evident that the practice of making brass several hundred years ago was little different from that of the present day, except as regards the constituents of the mixture. If we omit that part of the practice which refers to the preparation of calamine and substitute spelter, there has been very little improvement except in minor details.

The ancients worked brass mostly under the hammer. Fig. 4 shows a forging plant operated by water power. The details of the equipment are shown in Fig. 5. The practice here shown, according to Galon, was instituted about 1695. Each waterwheel operates a gang of three

FIG. 11. MODERN BENCH INSTALLATION FOR WIRE-DRAWING

hammers. The cast bars and other shapes are worked into final form under the hammer. The descriptions which accompany these illustrations in the original manuscripts, tell how the metal is heated and annealed between the successive reductions under the hammer.

Fig. 6, a reproduction of an illustration made in 1764, shows two views of a machine for finishing brass kettles and other vessels. The process is interesting, in that it resembles the modern process of spinning brass. The work-head is driven by belt *K* through the pulley *I;* the vessel is mounted in the work-head *M* by clamping between *M* and a movable center *P* which is engaged by the fixed center *Q*. *Z* is the tool used by the workman in forming the interior of the vessel. After the brass is hammered into long wide strips, it is cut into narrow strips preliminary to subjecting it to a drawing operation. The shears, Fig. 7, are operated by pressure from the knee of the workman, and the width of the strip is determined by a limit guide *D* carried on one of the blades of the shear, as shown in the sketch at the right. The illustration is taken from Galon, 1764. Although practically all copper and brass was worked under the hammer, we find in Swedenborg's *"Regnum Subterraneum Sive Minerale de Cupro et Orichalco,"* 1734, a description of a set of rolls for rolling copper and brass sheet. An illustration taken from this book is shown by Fig. 8.

The strips of sheet brass referred to in Fig. 7 were drawn into wire in draw-benches similar to the one shown in Fig. 9. The pulling power was derived from a rotating shaft, *S* the return stroke being accomplished by the retraction of a spring pole *10*. A die plate with the different size holes located in the one plate is shown at *46*. The clamping mechanism, *u*, is shown in detail in Fig. 10, which is a reproduction of an illustration used by Galon in an article printed in 1764. It shows another form of drawbench which is interesting on account of the details. The gripping tongs *31* are specially interesting when compared with those shown in Fig. 11, a photograph of an installation in use in a modern plant. The lever which comes up through the floor and carries the tong-grip, travels back and forth along the bench, giving a short-stroke draw. In a modern plant it is used to draw the first few feet of wire through the die, so as to get enough wire to permit fastening it to the drum, then the tongs are laid aside and the drum does the drawing. Comparison between this illustration and Figs. 9 and 10, shows remarkable similarity between the method here used to start the drawing operation and the method used by the ancients for all wiring drawing.

Economical Press Work in Small Lots

By FRED. H. COLVIN
Editor, *American Machinist*

Punch and die work, to say nothing of forming or drawing, is usually a matter of long runs, with thousands or hundreds of thousands of pieces to make it profitable to make the dies. And yet in a country with but little manufacturing on a large scale, it is often necessary to do work of this kind in small quantities.

Where the number wanted goes up into millions, as is often the case, the cost of dies is distributed over such a large number that it becomes negligible. This justifies us in spending almost any amount of money for dies if we can reduce the time per piece by a few seconds or even a single second at times.

But if we put a man who is an expert in this kind of work, up against an order for one or two hundred—rarely more than a thousand—with only one punch press in the shop on which all work must be handled, we have an entirely different proposition.

This is the kind of work which comes to the Wahlstad Machine Co., of Tacoma, Wash., and A. N. Wahlstad has devised some very ingenious methods of doing work of this kind.

Combinations of Dies

Elaborate dies are not to be thought of, as the expense must be kept as low as possible. And to reduce costs to the lowest limits, Mr. Wahlstad has developed a

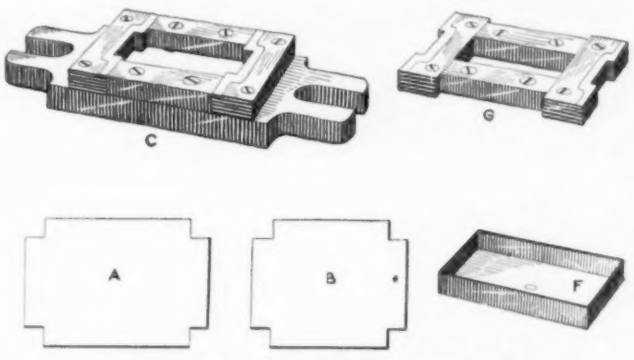


FIG. 1. DIE FOR TWO SIZES OF CAP

system of built up or combination punches and dies which is extremely interesting to any small shop man.

He has what might be called standard bolsters or bases, on which he can assemble various combinations of dies or sections of dies, that he can often combine to secure what he needs for a new job. Most dies are sectional, built up by screwing pieces to a suitable bolster, and combinations are often possible.

After a job is done, a sample is always left with

the dies or die parts, and in many cases the dies are wired to a strip or sheet of steel, together with the sample piece. This piece is stamped with the number of the bolster on which the parts were used, with the numbers of other die parts if any were used, and the number of the punch or punches used on the job.

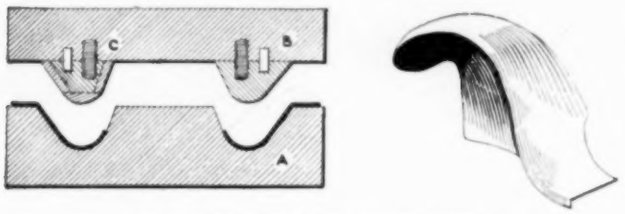


FIG. 2. BABBITT DRAWING PUNCH

Should a repeat order arrive, this method makes it easy to re-assemble the punches and dies for another lot. It also makes it easy to make up new combinations as the sample shows exactly what kind of work, punching, bending or cutting was done on the piece, and just how much of this die, if any, can be used on a new job. This plan also reduces the amount of idle metal in bolsters, etc., which would otherwise be necessary. A few examples of work done in this way are shown herewith.

Two Sizes in One Die

A good example of ingenious die design and construction for small runs, was made for tent-pole caps as in Fig. 1. The order was for 200 of two sizes, which meant that the dies must be made quickly and cheaply. The two blanks are shown at *A* and *B*, the sizes being the same except for length.

This made it possible to use a sectional die, as at *C*, for punching the blanks, and by changing the pieces *D* and *E* for shorter ones, to cut both sizes with the same die. The punch was made to cut both sizes by inserting a central piece or "spreader" to cut the long blank.

These blanks then had to be drawn into cups, as at *F*, and to do this the cutting blocks of the die were reversed, as at *G*, presenting the proper opening for cupping the pieces. Plain punches, square and oblong, were used, locating the work by the hole punched in the center, making it easy to draw the caps into the desired shape.

Dies of this kind can be readily adapted to a variety of shapes, making it possible to handle quite a variety of work of this kind with a few dies.

Drawing Punches of Babbitt

Another unusual and interesting die is shown in Fig. 2. This is for pressing up fenders for toy motor trucks, but the requirements were not large enough to warrant an expensive die.

A model was made for right and left fenders and a block made of cast iron, as at *A*, with the two cavities. The cavities were smoothed up with a file and scraper and then it was in order to make the punches.

A base or punch block was provided with threaded studs as at *B* and *C*, and also one or two dowel holes. This punch block was suspended over the die block, with the studs in the depressions, and provisions made for pouring babbitt into the depressions. A hard mixture was used, and flowing around the threaded studs and into the dowel holes, locked the babbitt to the punch block as at *B*. This gave the punches the same shape as the depressions.

Knowing that the babbitt would not stand the pressure, it was trimmed up all around and steel plates *C*, fastened to it with screws to take the wear and to support the babbitt. This has proved very satisfactory; about 11,000 pieces having been formed to date. The cast-iron die is still O.K. but the babbitt had to be refaced after 5,000 stampings. The new plates were case hardened and are standing up better.

Two Wire-Bending Jobs

Two examples of wire bending may show ways and means devised to get work out with few dies and by utilizing anything that is available in the shop. The piece shown in Fig. 3 is perhaps 15 in. long and of about $\frac{1}{16}$-in. wire or rod. The end bends are made in simple built-up dies as at *A* and *B*. These operations leave the piece far from square in the corners which have to be finished in another operation.

A simple die *D* is made to the proper shape, the block *C* is inserted and a stroke of the press squares the corners and straightens the back. The piece *C* can be made loose enough to be inserted without difficulty.

A somewhat similar piece, but one in which the bottom had a large V in it, was finished in a shaper. The first bends, which were more complicated than shown,

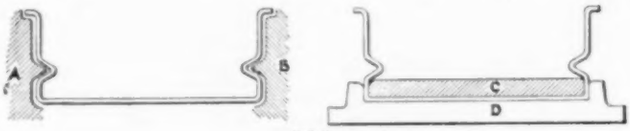


FIG 3

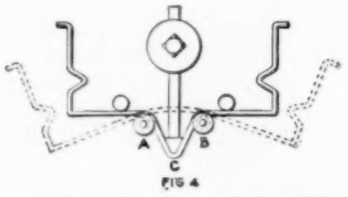


FIG 4

FIG. 3. SQUARING BOTTOM OF WIRE LOOP
FIG. 4. WIRE WORK IN A SHAPER

left the piece rather badly bowed in the long portion. The corners were square, however, and it was found that a good job could be done as shown in Fig. 4.

The two grooved rollers *A* and *B* were fastened the proper distance apart on the shaper table. Then a tool *C* was fastened in the toolpost and the ram travel set so as to force the wire the correct distance. When this was done, it was an easy job to form the V in the wire and leave the work in good shape for its future use.

Efficient Pattern Work

By A. E. Holaday

Referring to the article published on page 516 of the *American Machinist* under the title "Efficient Pattern Making," I will cheerfully admit that this is a quick way to produce the pattern in question, but I think that a great deal of credit is due the molder who made the mold. It is no easy matter to anchor cores in the cope, and if the molder did not fully understand his work the pattern would have been of little use.

Give the molder fifty-fifty on this job.

Labor-Saving Methods in the Foundry

By PETER F. O'SHEA

The different methods of pouring used for different classes of work in a certain foundry are described. The arrangement of the departments and the direction of movement of the materials is treated, so that an idea of the method of operating the foundry can be gained from the article.

THE foundry of the Chapman Valve Manufacturing Co. is laid out into sections or floors so that different classes and sizes of work can be handled. In each section the method of handling the ladles while pouring is different, so that it is suited to the work being done. The building consists of three parallel bays, with a monitor roof over the center bay, giving room for a large electric crane. Flasks are laid out in one end of the building in all three bays. The middle bay or floor is used for sweep molding. Here big ladles are carried by the large crane.

The bay along the south side is for standard-sized flasks of medium dimensions. The flasks are placed at regular intervals, with all those of the same size in the same rows. The ladle is brought by an electric hoist on a trolley track from the cupolas, which are at the middle of the long building, along the aisle just outside the posts which divide the side bay and the central bay. At the end of the row of flasks which are to be filled the electric hoist stops and transfers the ladle to a smaller air hoist which runs on a trolley track of its own in a direction at right angles to the length of the building. The transfer is made by bringing the hook of the air hoist under the ladle handle beside the hook of the electric hoist, and relieving the latter of its load. By means of the air hoist the ladle can then be adjusted to the exact height necessary for pouring each flask. In each row from aisle to wall the flasks are as nearly as possible of the same height, so that little or no adjusting of the height of the ladle has to be done along each row. The pouring from the ladle can be quickly done. One man handles the ladle, the other assists him and handles the valve of the air hoist.

A series of these transverse trolley tracks runs across the ceiling of the bay, with a header track connecting them so that the air hoists may be transferred from row to row. Each transverse track is above the narrow cross aisle between two rows of flasks, so that in laying out the flasks, care must be taken to arrange the rows to correspond to the tracks above. Since this floor is long, several air hoists may be at work at once. The electric hoist travels back and forth to the fires for new ladles and acts as a feeder for the pouring gangs to keep all parts of the floor supplied.

SMALL-CASTINGS BAY, SHOWING POURING DEVICE

In the bay on the other side of the building, smaller sizes of standardized flasks take up half the floor. Overhead tracks again support the ladles above the flasks, and the same sort of electric hoist employed in the other bay is used to bring ladles along the length of the building. The track of the hoist can be seen in the accompanying illustration. But the small hoists used here to take the ladles from the main hoist and bring them along each row of flasks are different, being really ratchet-operated pouring devices. Since the

flasks here are smaller and there are more of them in the same length of row, the ladle has to tip oftener on its way down the row, the ratchet device being better adapted for quick handling under these conditions than the air hoist. Of course the flasks are laid out strictly level with each other, as the illustration shows.

The other half of the same bay, shown in the right back ground, is used for pouring miscellaneous-sized small molds. Here the flasks are not laid out so regularly, and the ratchet pouring device would not be practicable. Consequently, hand ladles, filled from a supply ladle carried on a hoist down the main aisle, are used, each hand ladle being handled by two men as usual.

The standardization of size of most of the flasks saves a great deal of time in pouring and handling. There are three standard sizes, and for each size all the halves of the flasks are interchangeable. In selecting the proper size of flask for a given pattern, care is taken to pick the smallest which will contain the work, so as to save weight and time in molding and handling.

The layout of the iron foundry is such that the movement of castings is from the south to north of the building. Molten iron and a few cores are the only things that move in the other direction. Coke and pig iron come in from the side. The cupolas are at the middle of the building, on the west side. Just outside the west wall runs the railroad track, by means of which coke, pigs and sand are brought to the plant. The track is on a higher level than the molding floor, the difference in height being about fifteen feet. Core sand is dumped from the cars through holes in the wall into pits, at the inner ends of which the sand is discharged on the foundry floor as wanted. The pile of sand is lower than the cars, but higher than the floor of the foundry, so that gravity does most of the moving. The core sand is cut in a mixer at the foot of the piles. Large cores are made at this part of the floor, within a short distance from the mixer. Small cores are made upstairs, for they are light and easy to handle.

Pig iron is taken from the cars by a lifting magnet, and either brought directly to the furnaces or stacked on the ground on the side of the tracks. The magnet lifts the iron from the pile or the car to the floor of a steel superstructure, where it is transferred to dumping cars which run inside of the building and dump it into the cupolas. The railroad tracks are thus on a level midway between the foundry floor and the tops of the cupolas between the core sand pits below and the pig feeding platform above.

On the other side of the railroad tracks opposite the foundry building is a row of low brick pits for reserve supplies of molding sand. On the floor at the southern end of the molding floor is a pile of molding sand, which is replenished by the aid of a small movable belt-conveyor run by an electric motor. This piler is also used in handling coal and sometimes coke, and in evening up the piles of core sand in the pits.

Large cores and molten iron are therefore distributed from the middle of the building. Small cores, molding sand and flasks are distributed from the southern end forward over the three parallel molding floors. After the iron is cool and the flasks are taken off the castings, the castings continue to move forward toward the northern end of the building. The northern end beyond the cupolas is used for cleaning, tumbling, snagging and pickling.

As soon as the castings are made and the molders have gone, that is, at 4 o'clock in the afternoon, the floor-cleaning gang comes and cleans up the molding floor, putting it in condition for the next day's work.

Cutting Off Bars in Multiple

By E. C. Brandt

The accompanying illustrations of a 42-in. cold saw show a set-up for cutting off a number of 3¾-in. diameter axle steel bars, which were necessary to be square and within about 1/32 in. of length to suit fixtures to be used on succeeding operations.

With the fixture, as shown in Fig. 1, it can be seen that only a short length of travel is necessary to cut off all the pieces, the stock being held so as to permit the topmost piece to be cut off ½ in. in advance of the bottom piece. This is considered much more advantageous than having all of the five pieces cut off at the same time, as it gives the operator a chance to remove one piece after another. If he fails to do this, however, no damage is done, as the fixture retains the piece cut off.

A general view of the set-up of the long bars on a trolley extended from the machine is given in Fig. 2, and it will be noted that a container having the same contour as the holding fixture is used for holding the rear ends of the bars. The bars are securely clamped in the container on the trolley so that they are all brought forward together and the pieces from any one cut will be of the same length.

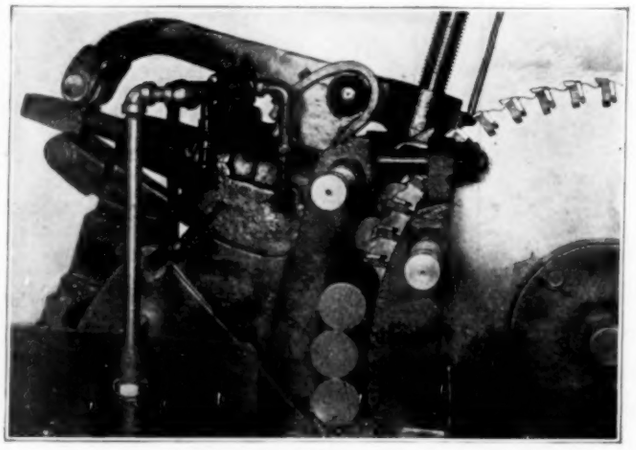


FIG. 1. FIXTURE FOR HOLDING THE BARS

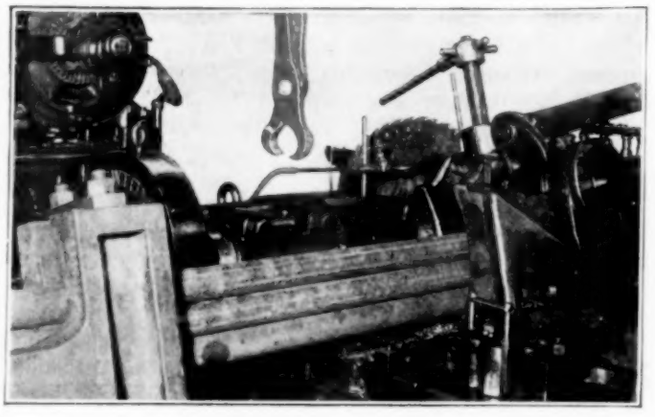


FIG. 2. GENERAL VIEW OF THE SET-UP

Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris

III. The Mergenthaler Linotype Co., Brooklyn, N. Y.

The company under consideration in this article trains not only trades apprentices and machine specialists, but also operators for the machines which it builds. The system of instruction in the different lines has been developed to suit the special conditions existing in the plant. This article deals chiefly with the training given the machinist apprentices.

(*Part II was published in the Oct. 7 issue.*)

THE Mergenthaler Linotype Co. offers an example of a moderate-sized plant in which a wide variety of training is given to employees. The product of the plant is the very intricate linotype machine, requiring for its production and constant improvement an engineering staff, a corps of machinists and, chiefly, a large number of specialist mechanics. Altogether some 3,000 people are now employed, including 500 females. The plant is, however, expanding, which is a condition that even more urgently suggests the desirability of special training facilities along the lines peculiar to the concern. To consider first the provision for apprenticeship, there are in the plant at present fifty-five apprentices in the machinists' and toolmakers' trade. This corresponds to the reasonable ratio of one apprentice to five journeymen, there being a total of 269 employed in the toolroom at the time that this plant was visited by the author. Boys, aged sixteen to twenty, are admitted to the four-year course provided and it is preferred that they come directly from school. The usual requirements of sound health, good morals and the completion of a grammar-school education are insisted upon. Selections are made from the waiting list, on which there are at present twenty-two enrolled.

There is no part-time supplementary school provided, though there is a limited opportunity for after-work instruction in blueprint reading, shop arithmetic and gage reading, and in the public night schools there is plenty of opportunity for further study. Careful instruction is, however, given on maintenance work, which provides the opportunity for the greater part of the practical experience.

After the trial period of the first six months of employment, if the boy is judged satisfactory, an agreement is signed between the company and both his parents, if living, or his guardian, to complete the period of apprenticeship, the company binding itself to "carefully and skilfully teach every branch of the business of machinist and toolmaker" with the reasonable conditions stipulated. These conditions, except for the limited amount of supplementary instruction, seem particularly satisfactory.

The rate of wages per hour is based upon the prevailing hourly rate paid to toolmakers by the company, the rate being classified according to six-month periods. For the first period it is 25 per cent of the journeyman's rate, for the second 31 per cent, and for the third 37 per cent. For the remaining five periods the respective percentages are 50, 55, 60, 75 and 85. The company employs a novel basis for bonus payment on satisfactory completion of the course, in that the amount is not fixed, but is 10 per cent of all wages paid during the period of apprenticeship. Also, a set of toolmaker's tools valued at $20 and which is loaned during the period of apprenticeship, is presented to each boy with the diploma when he graduates.

Careful records are kept of each apprentice, "including his efficiency, initiative, progress, obedience, attendance, etc., and at the expiration of the third year if, in the opinion of the company, the record of the apprentice warrants it, this company will permit said apprentice to graduate three months from that date and present him with his diploma;" that is, nine months are deducted from the term of service because of good record, making the full term three years and three months.

The schedule of training, modifiable at the discretion of the management according to the record of the apprentice, is as follows: One month, tool crib; eight months, lathes; eight months, plain and universal milling machines; five months, grinding machines; three months, planers and shapers; six months, bench work and assembling; one month, radial drilling machines and boring mills; and twelve months, tool work. Fig. 1 shows the form which the foremen use

in reporting upon the apprentices, while Fig. 2 shows the type of report card which is sent to the parents of the boys. One feature of the agreement is that, "Graduates of the State Education Shop of New York, or any other equally good training school, shall be allowed the same number of satisfactory hours which they spent in that school to be applied on this apprenticeship. They will also receive the regular bonus given on the satisfactory completion of this apprenticeship." It should be said, however, that the management prefers boys coming directly from the elementary or high school.

Another of the company's interesting schools is that maintained to train operators for its customers' machines. A six-week course is provided, during which the student receives instruction in operating and repairing the linotype machine, including its assembling and dis-assembling. The equipment of the department used for this purpose consists of twelve machines, which fixes the limit to the size of the classes. There is provided also a variety of models for amplifying and illustrating the instruction, which is given by two experienced operator-mechanics.

The equipment of the school for operators just described was used during the past winter to provide a type of technical extension course. Fifteen of the engineers and departmental heads met after office hours two nights a week for an hour to get direct first-hand instruction on the operation and construction of the machine.

Special night classes for general machinists were also provided two nights per week, with units in blueprint reading, shop arithmetic, and gage reading. There were during the past term classes of seventy for six one-hour periods in blueprint reading, and of twenty-five for similar courses in shop arithmetic and gage reading.

The engineering department is conducting a school for breaking in novices as specialists on one type of machine. Those in training are usually "floaters," but only young, ambitious fellows of ages running from twenty-two to thirty are selected. The course lasts five to six weeks, and fifteen men are now constantly going through it.

A rather informal system of foreman training is provided, the foremen meeting with company officials once a week, when the various problems of production and employee control are discussed and suggestions for their solution are made.

Name .....

Department .....

	Grade	A 90-100	B 80-90	C 70-80	D 60-70	E Below 60
INTEREST	Interest	Enthusiastic	Very Interested	Interested	Lacks Interest	Disinterested
APPLICATION	Application	Very Industrious	Good Worker	Steady	Fair	Lazy
APTITUDE	Aptitude	Very Quick to Learn	Apt	Learns Readily	Slow to Learn	Dense
RELIABILITY	Reliability	Trustworthy	Reliable	Satisfactory	Irregular	Unreliable
CONFIDENCE	Confidence	Excellent	Self-Reliant	Confident	Lacks Confidence	Timid
CONDUCT	Conduct	Exceptional	Very G'llemanly	Well Behaved	Troublesome	Unsatisfactory
ACCURACY	Accuracy	Except'ly Accurate	Accurate	Average	Inaccurate	Careless
SPEED	Speed	Very Rapid	Rapid	Good	Slow	Very Slow
KNOWLEDGE OF WORK	Knowledge of Work	Excellent	Very Good	Good	Fair	Poor
INITIATIVE	Initiative	Excellent	Very Good	Good	Fair	Poor
ATTENDANCE	Attendance	Excellent	Very Good	Good	Fair	Poor

REMARKS: .....

Dated .....

Please Fill Out and Return Promptly to Employment Dept.

FIG. 14. CARD USED BY FOREMEN IN GRADING APPRENTICES

Reminiscences of an Old School Machinist

BY R. THOMAS HUNTINGTON

The apprentice of half a century ago was not overburdened with money. When I started in I received three dollars per week for the first year; four dollars and fifty cents for the second year and six dollars each week during the third year. Following this period there was one year "under instructions" at the rate of one dollar and a half a day, after which a boy was supposed to have become a journeyman and worth all he could get. Ten hours per day, six days a week, was the rule, there being little overtime in the shop where I was employed. In winter and on dark days a small tin hand lamp, burning whale oil, was supplied to each man, and these lamps constituted the only source of light, except daylight. The shop was heated (?) by coal stoves, there being usually two to each room of 12,000 square feet of floor space.

Accommodations for washing were provided by water buckets of which the company furnished one to each three men, who used it in common and took turns in filling and cleaning it—when they didn't forget it, or put off the job until tomorrow. If a man was too fastidious to use a community bucket he was privileged to go buy a bucket of his own and clean it whenever he felt like it. One man I knew

QUARTERLY REPORT

EMPLOYMENT DEPT.

..... has earned the

following standing for the Quarter ending APR - 1 '20 19 .....

SHOP RECORD											SCHOOL RECORD									
Interest	Application	Aptitude	Reliability	Confidence	Conduct	Accuracy	Speed	Knowledge of Work	Initative	Attendance	Mathematics	Science	Drawing	Shop Practice	Note Book	Civics	Industrial History	Commercial Geog.	Absences	Times Tardy	Conduct

SCALE OF MARKING

A—90-100 D—60-70

B—80-90 E—50-60

C—70-80 F—Failure

(Over)

APPRENTICESHIP DEPARTMENT

MERGENTHALER LINOTYPE CO.

..... *Foreman Tool Dept.*

FIG. 15. REPORT CARD SENT TO PARENTS OF APPRENTICES

used to replenish the water in his bucket regularly—once a month.

If we wanted warm water we could always manage to get a piece of scrap iron in the fire just before quitting time, and after the whistle had blown there would be a great hissing and spluttering about the shop as these pieces were dumped into the buckets to heat the water.

Some of the machinery in use in the shop dated from 1834 or earlier, as my uncle, William Norris, the predecessor of the firm by which I was employed, built six locomotives in that year, said to be the first of such machines to be built in America. The shop of that early day was a barn on what was then called "Bush Hill" in Philadelphia, about where the mint now stands at 17th and Spring Garden Streets.

The article on pages 1 to 8 of the current volume of *American Machinist* shows some very good illustrations of the class of machinery with which my boyhood was familiar. The rich carvings and curlicues were fine receptacles for grease and dirt which we boys were required to clean out each week, and that ceremony did not add to the respect and veneration in which we held these works of art. The painting was very gorgeous, hardly any two machines being painted alike; and whenever there was a space for a panel some very interesting scenery would be depicted.

At the time I commenced to work there (1863) the plant covered about six squares, three on each side of 17th St., reaching from Spring Garden St. to the Reading Railroad. A force of nearly 1,200 was employed. There were machinists, blacksmiths, copper-smiths, sheet metal workers, pattern-makers, boiler-makers, carpenters, molders in both iron and brass—in fact every kind of tradesman whose work was necessary to locomotive construction at that time was represented. Everything except sheet metal and tubing was produced in the plant.

The proprietors of the shop were Richard Norris and Son (Henry L. Norris). The entire office force was summed up in the persons of Mr. Norris, Sr., who attended to all the correspondence; Mr. Norris, Jr., who was timekeeper and paymaster; one bookkeeper and accountant, and one office boy.

Mr. Norris paid off the help every Saturday morning and, believe me, he had some job. Two laborers would carry a booth from department to department and each man would come up in turn to the booth, giving his name and the number of hours he worked. Mr. Norris would turn to the page in the big ledger where the man's account stood, and if the figures given by the man tallied with the book, the amount due him would be counted out from a tin cash box where each denomination of bill and coin was stacked in its respective compartment.

There was seldom any error or disagreement; if there was, the man would step out of line and in the afternoon would go to the office where the difference would soon be adjusted. Payment was made in bank bills and specie (when the banks had any) and small change was mostly in what they called "shin-plasters" in denominations of 5, 10, 15, 25 and 50 cents.

Each of the apprentices was given an opportunity to try his hand at all the work there was, according to his stage of advancement. The turning of the long connecting rods of the locomotives is a job I shall always remember. The forgings were first planed on two sides, the finish being a "water-cut" which left them quite smooth. The stub ends were also planed on the edges to receive the strap that served to take up the wear of the pin brasses.

The rods were then centered by means of two large center punches, one being ground to an angle of 90 deg. while a somewhat sharper-pointed one was used for a starter. A center would be about $\frac{5}{8}$ in. in diameter at the outer end; the smaller punch leaving it deep enough so that the lathe center could not bottom on the point.

Turning was done on two long lathes, one of which had only a hand feed. The rods were first squared to the length indicated by a wooden template, on which was also marked the diameters. From the inner ends of the rectangular parts they would be filleted down to the smaller diameter and turned from there in two long tapers meeting in the center of the rod at the largest diameter.

All dimensions were given on the wooden template; the only drawing was in the possession of the foreman and there were no blueprints for each of the workmen in those days.

The preliminary work was done in the lathe with the hand feed, and the turning of the long tapers in the other lathe which was equipped with a "chain-feed." On the longer rods we had to use a center rest holding the rod steady by means of a "cat," which was a large collar supported and trued up on the center of the rod with eight headless setscrews.

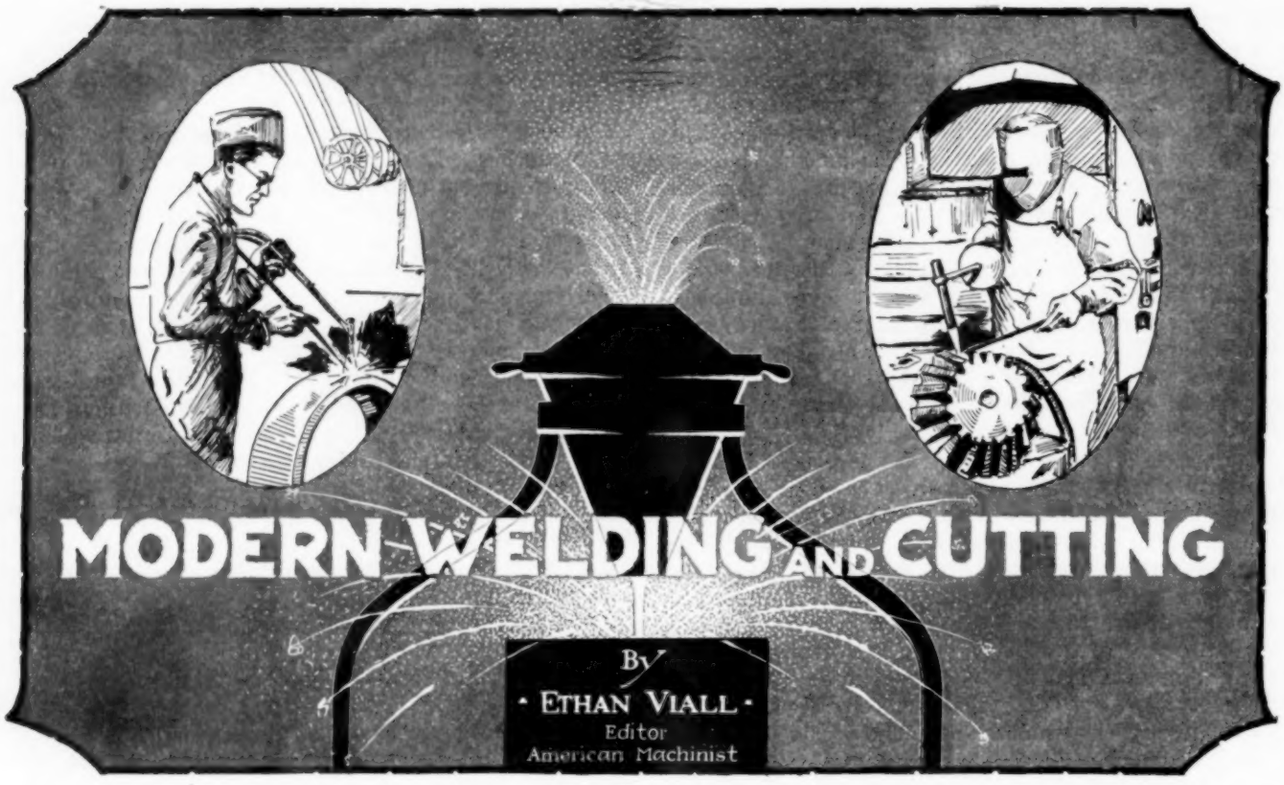
By dividing the work between the two lathes in this manner the workman was kept pretty busy. While one lathe was turning the tapers on one rod, the man would have his hands full in centering up, squaring the ends, and otherwise making the next rod ready, meanwhile keeping one eye on the lathe that was running, for the light construction of the machine in conjunction with the uncertain movement of the carriage by reason of the long chain connection did not inspire confidence in the reliability of its performance.

After the lathe work was finished, the rods were finished by drawfiling, and the foreman was very particular about this part of the work. The boys used to say that he could see a scratch from clear across the room, and woe betide the unlucky wight who failed to get them all out.

In fitting the straps there were two bolt holes to drill through strap and rod, and these had to be a nice driving fit for the bolts where the latter passed through the rod ends. The holes in the strap were afterwards elongated to allow for end movement of the strap to take up wear of the pin brasses.

Besides the bolt holes there was a large hole rectangular in shape and tapered from the top to bottom of the rod, to take the key and liner. These holes must be nicely fitted to the key and this was no easy job with no tools but flat drills, chisels and files. Advanced apprentices were expected to be able to do all this work satisfactorily, but it was sometimes necessary to invoke the services of a journeyman in order to save the rod from the scrap pile.

The foreman was the busiest man on the job. Not only did he have all the drawings there were and have to transmit instructions verbally to the workmen, but he was inspector as well and was held responsible for all work coming from his department. With from 30 to 50 men and boys to look after, ten hours per day, he had few idle moments.



ASIDE from arc-welding machines, which have already been described, electric welding machines may be all included under one head—RESISTANCE WELDING MACHINES. These are divided into butt-, spot-, seam-, mash- and percussive-welding classes. The first three are sometimes, for manufacturing purposes, used in combinations in the same machine, such as a spot-and-seam machine or a butt-and-spot-welding machine, and so on. This does not mean that these different methods of welding are carried on at the same time, but that a welder can do work on the same machine by simply shifting the work, or a part of the fixture. In butt-welding, alternating current, single phase, of any commercial frequency such as 220, 440 or 550 volts, 60 cycles, is commonly used. Lower voltage and lower frequencies can be used, but they add to the cost of the machine. The machine can be used on one phase of a two-phase or a three-phase system, but cannot be connected to *more* than one phase of a three-phase circuit. Direct current is not used because there is no way of reducing the voltage without interposing resistance, which wastes the power. As an example, a d.c. plating dynamo will give approximately 5 volts, which will do for certain kinds of welding, but for lighter work, less current is needed. If resistance is used to reduce the current this resistance is using up power just as if it were doing useful work. The voltage at the weld will run from 1 to 15 volts, depending on the size of the welder and work. To obtain this low voltage, a special transformer inside the machine reduces the power line voltage down to the amount required at the weld. The transformer is placed within the frame of the machine, as shown in Fig. 361. The secondary winding of the transformer is connected to the platens by means of flexible copper leads. From the platens the welding current travels to the work clamps and through them to the pieces to be welded. As the parts to be welded are brought into contact a switch is thrown in and the current traveling across heats the ends of the work and when the proper welding heat is reached the operator pushes the two parts together and the weld is completed. Since the current value rises as the potential falls in the secondary circuit, and since the heating effect across the work is directly proportional to the current value it will be easily seen why a transformer is necessary to produce a heavy current by lowering the line potential. Due to the intermittent character of the load, there is no standard rating for welding transformers, and different makers frequently give entirely different ratings for their machines. However, regardless of the rating given in kilowatts capacity, there can be very little difference in the actual amount of current consumed unless an especially bad transformer design is used. To heat a given size stock to welding temperature in a given time requires an approximately invariable amount of current.

XXX. Electric Butt-Welding Machines and Work

Some points regarding butt-welding are omitted from this article for the reason that they were covered in the article "Electric Welding of High-Speed Steel and Stellite," which was published in Vol. 50, page 425. The present article deals principally with the more common of the standard makes and the work done by them.

(Part XXIX appeared in last week's issue.)

The machine just illustrated, is shown at a slightly different angle and with two pieces of rod in the jaws, in Fig. 362. This is the Thomson regular No. 3, butt-welding machine. It has a capacity of rod from $\frac{1}{8}$ to $\frac{3}{4}$ in. in diameter or flat stock up to $\frac{1}{4}$ x 2 in., in two separate pieces, or rings of $\frac{1}{16}$-in. stock and not less than

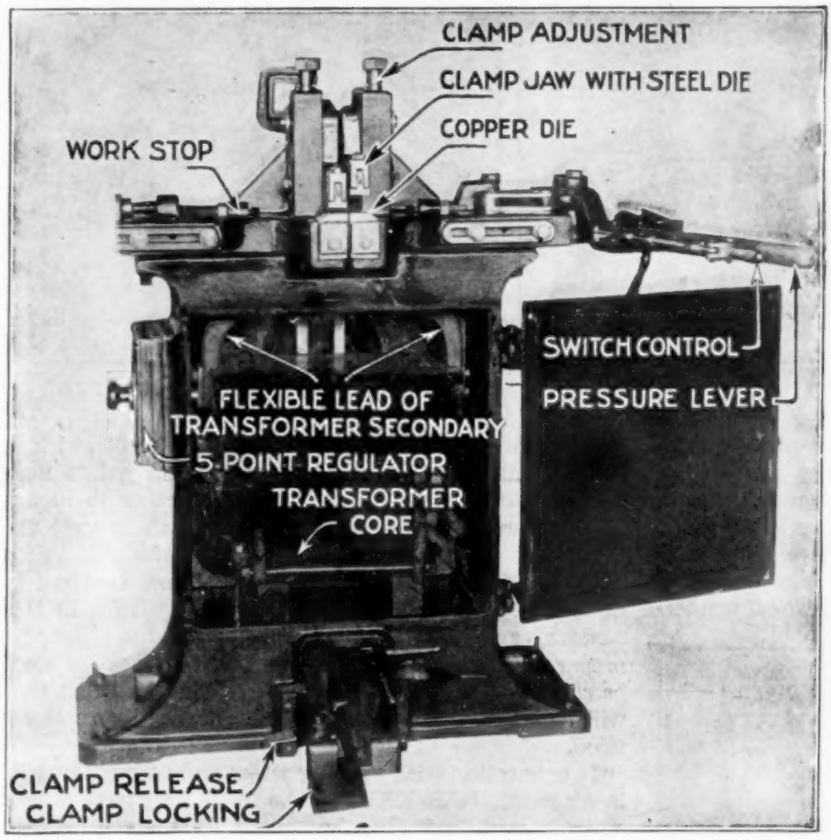


FIG. 361. PRINCIPAL PARTS OF A BUTT-WELDING MACHINE

2 in. in diameter. Hoops and bands up to $\frac{1}{16}$ x $1\frac{3}{4}$ in. and not less than $9\frac{1}{2}$ in. diameter when held below the line of welding, may also be welded. With jaws specially made to hold the work above the line of welding a minimum diameter of $4\frac{1}{2}$ in. is necessary. This machine will produce from 150 to 200 separate pieces, 150 to 300 hoops, or 300 to 400 rings per hour. The lower dies are of hard drawn copper with contact surfaces $1\frac{1}{8}$ x 2 in. x $2\frac{1}{16}$ in. thick. Standard transformer windings are for 220, 440 and 550 volts, 60 cycle current. Current variation for different sizes of stock is effected through a five-point switch shown at the left. Standard ratings are 15 kw. or 22 kva., with 60 per cent power factor. The dies are air cooled but the clamps to which the dies are bolted are water cooled. This type of machine occupies a floor space 40 x 33 in., and is 53 in. high. The weight is 1,750 lb. A close-up view of the treadle-operated clamping jaw mechanism is given in Fig. 363.

The method of operating the clamping jaws differs according to the size of the machine and the work that is to be done. On some of the smaller machines the type of hand-operated clamp shown in Fig. 364 is used. On some machines, intended to handle round stock principally, the toggle lever clamp shown in Fig. 365 is used. For very heavy flat stock, the hand-lever clamping mechanism, shown in Fig. 366, is used. On some of the machines used on small repetition work the clamps and switch are automatically cam-operated as shown in Figs. 367 and 368. The first machine is a bench type used for welding on twist drill shanks, and the second machine is used for welding harness rings. These jobs are, of course, merely examples as the machines are adapted for all sorts of the smaller welding jobs. Spring pressure, toggle-lever or hydraulic pressure are used to give the final "shove-up" according to the machine used or weight of stock being welded. In welding hard steel wire of over 35 per cent carbon content, it is necessary to anneal the work for a distance of about 1 in. on each side of the weld. This is due to the fact that the wire on each side is rendered brittle by the cooling effect of the clamping jaws. To accomplish this annealing, all the small Thomson machines used for this work are equipped with a set of V-jaws outside of the clamping jaws, as shown in front in Fig. 369. The wire is laid in these V's with the weld halfway between and the current is thrown on intermittently by means of a push button until the wire has become heated to the desired color, when it is removed and allowed to cool. The annealing of a small drill is shown in Fig. 370. The process of welding and annealing 12 gage, hard steel wire, requires about 30 sec. when done by an experienced operator. Copper and brass wire are easily welded in these same machines. The machine shown will weld iron and steel wire from No. 21 B & S to $\frac{1}{4}$ in. in diameter and flat stock up to No. 25 B & S X $\frac{1}{2}$ in. wide. Production is from 150 to 250 welds per hour, the actual welding time being $1\frac{1}{2}$ sec. on $\frac{1}{4}$-in. steel wire. The clamps are spring-pressure, with adjustable tension released by hand lever. The standard windings are furnished for 110, 220, 440 and 550 volts, 60 cycles. Five variations are made possible by the switch. The ratings are $1\frac{1}{2}$ kw. or 3 kva., with 60 per cent power factor. The weight is 120 pounds.

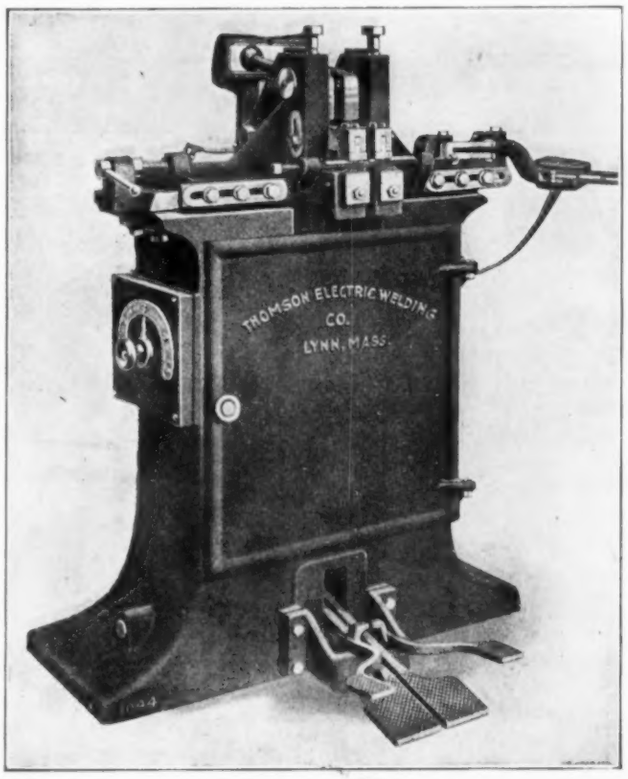


FIG. 362. BUTT-WELDING MACHINE WITH WORK IN JAWS

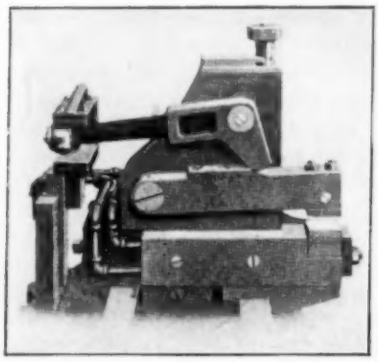


FIG. 363. DETAILS OF FOOT-OPERATED CLAMPING MECHANISM

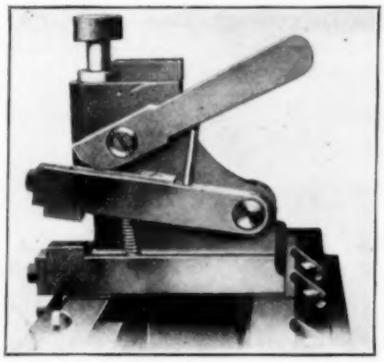


FIG. 364. A HAND-OPERATED CLAMP

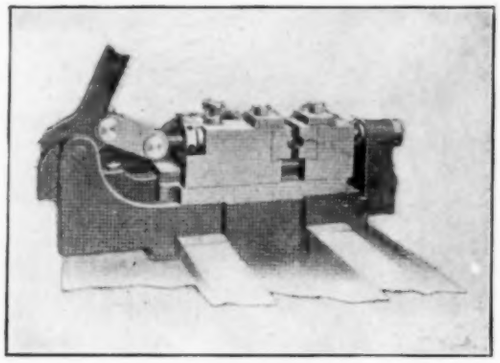


FIG. 365. TOGGLE-LEVER CLAMP FOR ROUND STOCK

For use in wire mills where it is desired to weld a new reel of wire to the end of a run-out reel on the twisting or braiding machines, it has been found convenient to mount the machine on a truck or small bench on large casters. This enables one to move the welder from one winding machine to another very easily, to splice on new reels of small wire, the electrical connection to the welder being made by flexible cord, which is plugged into taps arranged at convenient points near each winding machine. It is also desirable to mount on this same bench a small vise in which to grip the wire to file off the burr resulting from the push-up of the metal in the weld. The average time required to weld, anneal and file up a 16-gage steel wire with this bench arrangement is only about one minute. The only preparation necessary for welding wire is that the stock be clean and the ends be filed fairly square so that they will not push by one another when the pressure is applied.

In connection with welding wires and rods up to $\frac{3}{4}$ in. in diameter, Table XXVI will be found very handy. For sizes from $\frac{1}{4}$ to $2\frac{1}{4}$ in. the reader is referred to page 431, Vol. 50.

While as a rule, it is only necessary to have clean and fairly square ends for butt-welding in some cases where

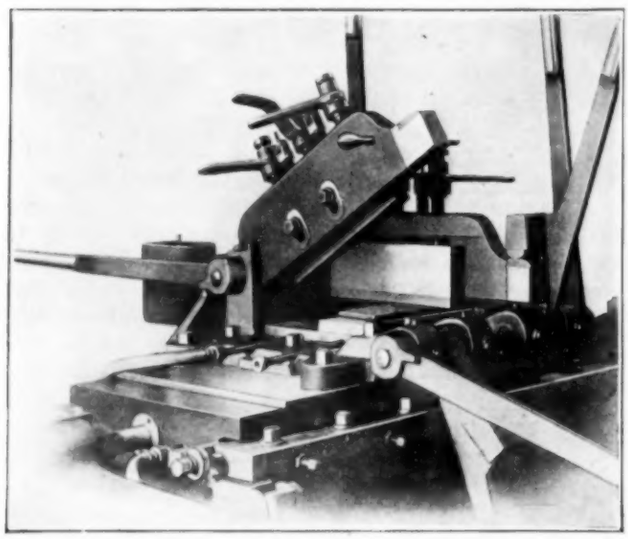


FIG. 366. CLAMPING DEVICE FOR HEAVY FLAT STOCK

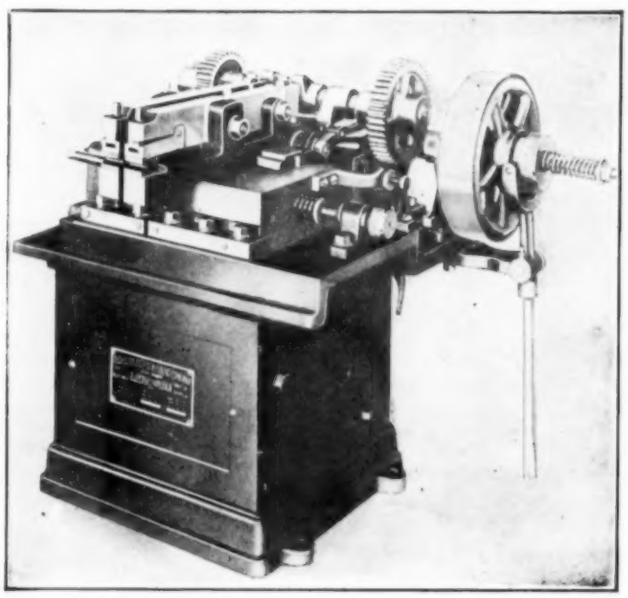


FIG. 367. A CAM-OPERATED MACHINE

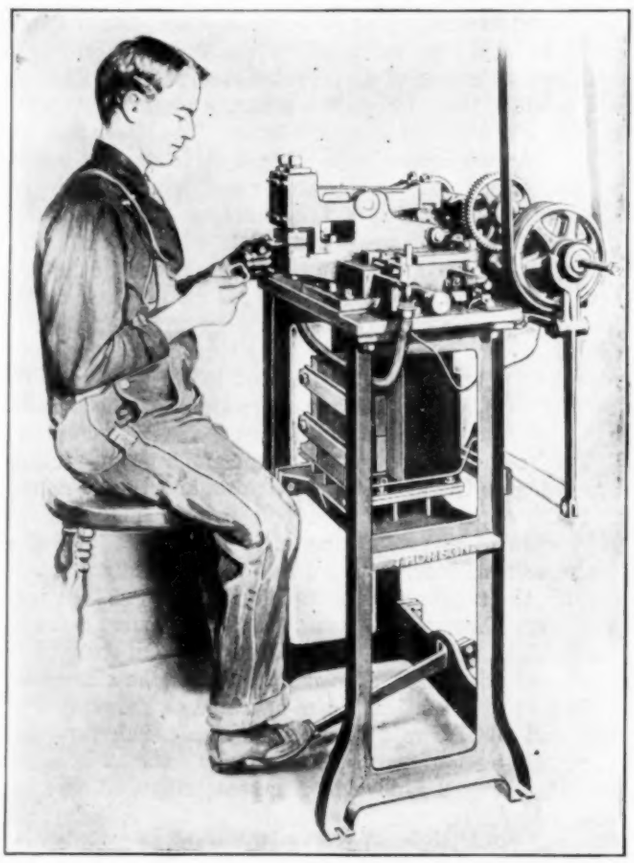


FIG. 368. AUTOMATIC-OPERATED MACHINE WELDING HARNESS RINGS

Dia. of rod in inches		Wire gauge		Dia. of rod in millimeters	Area of section in square inches	Current consumption per 1000 welds in K.W.H.	Cost per 1000 welds at 1 c. per K.W.H.*	Dia. of rod in inches		Wire gauge		Dia. of rod in millimeters	Area of section in square inches	Current consumption per 1000 welds in K.W.H.	Cost per 1000 welds at 1 c. per K.W.H.*
Dec.	Frac.	B. & S.	Birm.					Dec.	Frac.	B. & S.	Birm.				
.03196		20			.00079	2	$0.02	.2043		4			.03277	7	$0.07
.035			20		.00095	2	.02	.2362				6	.0438	8	.08
.0394				1	.00121	2	.02	.238			4		.0448	9	.09
.0403		18			.00127	2	.02	.25	1/4				.04909	10	.10
.049			18		.00169	2	.02	.2576		2			.0521	10	.10
.0508		16			.00205	2.5	.025	.2755				7	.0596	11	.11
.0625	1/16				.00307	2.5	.025	.284			2		.0633	11	.11
.0641		14			.00326	2.5	.025	.3125	5/16				.0767	12	.12
.065			16		.00332	2.5	.025	.3149				8	.0779	12	.12
.0787				2	.00486	2.5	.025	.3249		0			.0829	12	.12
.0808		12			.00513	2.5	.025	.34			0		.0908	13	.13
.083			14		.00678	2.5	.025	.3543				9	.0987	14	.14
.1019		10			.00817	3	.03	.375	3/8				.11045	15	.15
.109			12		.00934	3	.03	.3937				10	.1217	16	.16
.1181				3	.01025	3.5	.035	.4724				12	.1753	19	.19
.125	1/8				.01227	4	.04	.5	1/2				.19635	20	.20
.128		8			.01287	4	.04	.5612				14	.2472	26	.26
.134			10		.01411	4.5	.045	.625	5/8				.3068	30	.30
.1575				4	.01948	5	.05	.6299				16	.3115	34	.34
.162		6			.02061	5.5	.055	.7087				18	.3946	45	.45
.165			8		.02139	5.5	.055	.75	3/4				.44179	52	.52
.1875	3/16				.02761	6	.06	.7874				20	.487	60	.60
.1968				5	.03043	6.5	.065	.8661				22	.585	80	.80
.203			6		.0327	7	.07	.875	7/8				.60132	85	.85

*Multiply these values by the rate you are paying per K. W. Hour for current, to determine what the cost per 1000 welds for any size would be at your plant.

TABLE XXVI. APPROXIMATE CURRENT CONSUMPTION FOR WELDING UP TO ¾ IN. ROD

small welding is to be done it has been found best to bevel or V the abutting ends. This is more apt to be the case with non-ferrous metals however, than with iron or steel. A notable example in the larger work is in the scarfing of the ends of boiler tubes when butt-welding is done. This phase of the question has apparently not been given the attention it deserves, and some cases where welding has been declared a failure in manufacturing may be laid to the fact that the parts to be welded were not scarfed and consequently would not stand the required tests after being welded. As a general rule, a properly executed butt-weld should, when reduced to the size of the original section, have practically the same strength.

Although copper and brass rod and strip can be welded with perfect success, owing to the nature of the metal it requires a specially constructed machine to secure the best results. Since copper has a very low specific resistance as compared to iron or steel, it requires much more current to melt it on a given size rod. A longer time is required also to heat a given size of rod as compared to steel, but when the plastic stage is reached the metal flows so rapidly that it must be pushed up with tremendous speed or the molten copper will flow out between the abutting ends. To effect this rapid push-up of stock the platen on which the movable

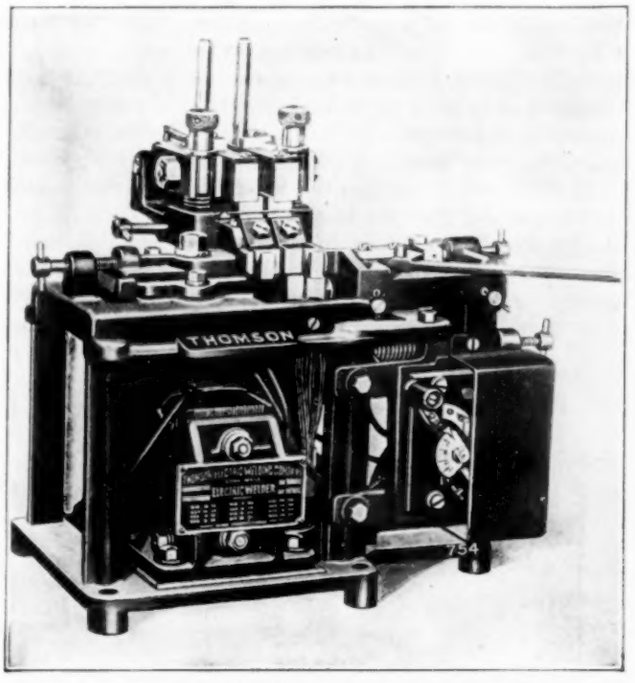


FIG. 369. MACHINE EQUIPPED WITH ANNEALING DEVICE

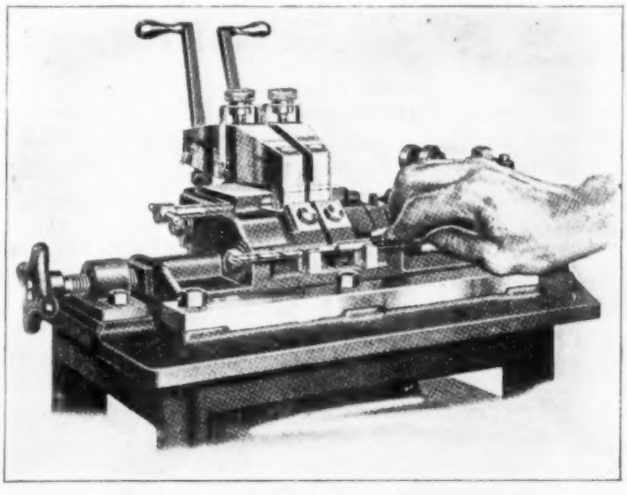


FIG. 370. ANNEALING A SMALL DRILL

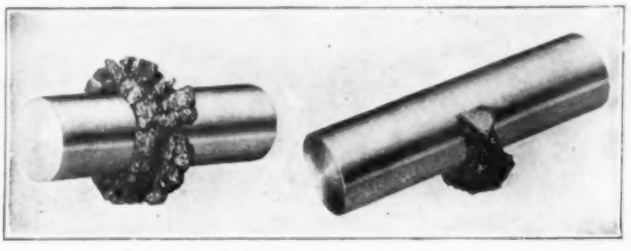


FIG. 371. TYPICAL COPPER WELDS

FIG. 372. WELDED ALUMINUM RING

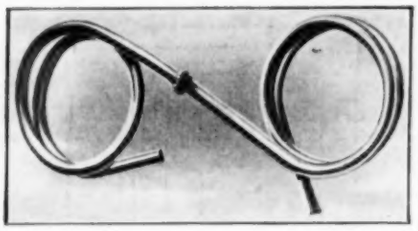


FIG. 373. A STEEL WIRE WELD

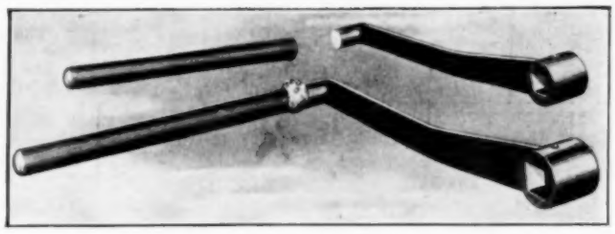


FIG. 374. WELDED HOISTING DRUM CRANK FORGING

right-hand clamp is mounted must move very freely indeed, necessitating roller bearings on the larger sizes of machines. The pressure spring on the smaller machines must also be capable of maintaining its tension through a longer distance than on a machine for iron and steel, since more metal is pushed up on a given size of copper rod than would be on steel or iron.

The properties of brass and also aluminum are practically the same as those of copper and therefore this special type of machine is just as well adapted for these metals.

Typical copper welds are shown in Fig. 371. The one at the left shows it just as it came from the machine, and the one at the right with the flash partly removed. Fig. 372 shows an aluminum ring immediately after welding. A steel wire weld is shown in Fig. 373, and a welded hoisting drum crank in Fig. 374. This last illustration shows how some drop forgings may be simplified and the cost of dies and production lessened. A large pinion gear blank is shown in Fig. 375. Made in this way, a large amount of time and metal is saved. The way to weld pieces of large and small cross section is described in the article on tool welding.

Band saws may be welded as shown in Fig 376. The way a band saw looks after welding and after the flash is removed is shown in Fig. 377.

Automobile Rim Work

One of the largest applications of butt-welding today is to be found in the automobile-rim industry. The special form of clamp shown in Fig. 366 was especially designed to handle rims of all kinds and sizes. It is not adaptable for any type of work other than flat stock, as the amount of jaw-opening is much smaller than the diameter of equivalent section of round stock.

No backing-up stops of any kind are built for these machines with rim-clamps, as stops are unnecessary for this class of work. In order to secure sufficient gripping effect of the stock to prevent it slipping in the clamp-jaws, the upper dies are made of self-hardening steel with the gripping surface corrugated. The lower dies, which carry all the current to the work, are made of copper with Tobin-bronze shoes on which the work rests, so as to give good conductivity and yet present a hard wearing surface to the steel rim. These lower dies must not only bear the gripping effort exerted by the steel dies above, but also the weight of the rim, which, in large sizes, amounts to considerable.

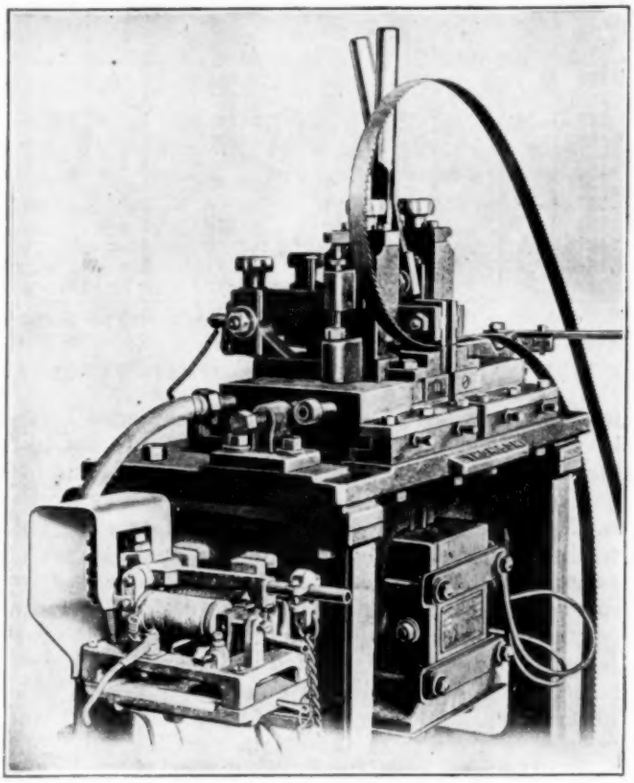


FIG. 376. WELDING A BAND SAW

The method employed in welding automobile rims is the "flash-weld" principle, wherein the current is first turned on with the edges to be welded pulled apart. The

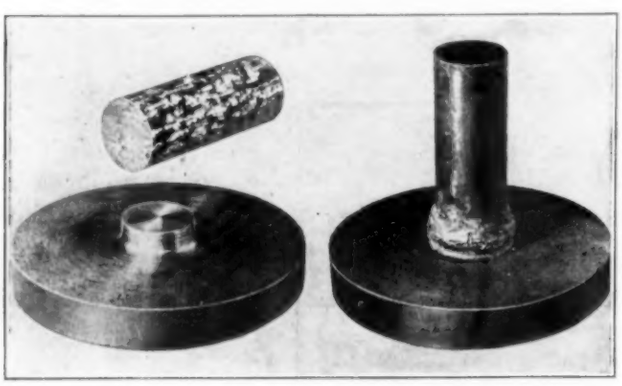


FIG. 375. LARGE WELDED PINION BLANK

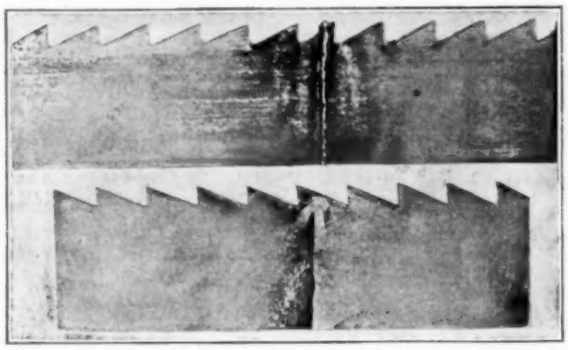


FIG. 377. BAND SAW WELDED AND SMOOTHED OFF

pressure is then applied gently to bring the abutting ends slowly together. As uneven projections come into contact across from opposite edges they are burned or "flashed" off, which is evidenced by flying particles of burning iron. The pressure is gradually increased, bringing more of the length of the opposite edges into contact and when the "flash" throws out for the full width of the rim which indicates the abutting ends are touching all the way across, the final pressure is quickly applied as the current is turned off, thereby completing the weld. It has been found that experienced operators on this kind of work do not look at the weld itself but govern their actions by the appearance of the amount of flash or sparks thrown out. When this assumes the

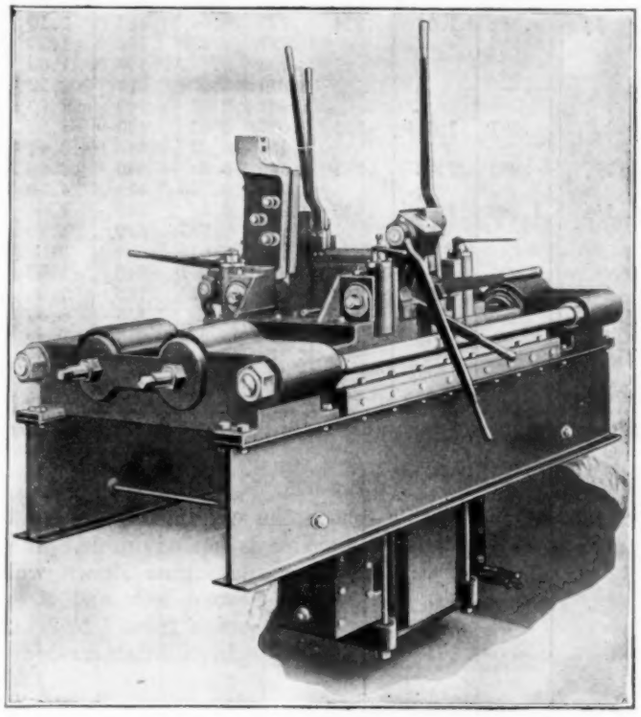


FIG. 378. TRUCK RIM WELDING MACHINE

shape of a complete fan they know it is the right moment to cut off the current and apply the final pressure.

The burr or fin thrown up in this type of weld is very short and very brittle, making its removal much easier than would be the case with the heavy burr resulting from a slow butt-weld. It is the common practice in rim plants to remove the burr while it is still hot and with a pneumatic chisel or a sprue cutter. The slight amount of burr then remaining is ground off with a coarse abrasive wheel and the rim is ready for the forming process. In most rim plants the operations of rolling, welding, chiseling burr, grinding burr, forming, shaping, etc., fit in so closely to one another that a rim is practically kept moving continuously from the time the flat stock is put into the rolls until a finished rim emerges. The welding operation itself on a rim blank for 30 x 3½ tire size, for instance, has an average production rate of 60 rims per hour, some concerns doing even better than this. On large truck rims for solid tires, having a section of 16 x ¾ in. thick, a production of 10 rims per hour is considered very good, although there are concerns doing even better than this on such heavy work. The machine shown in Fig. 378 was designed for handling heavy truck rims only. The lower jaws on this welder are placed very low in order that the

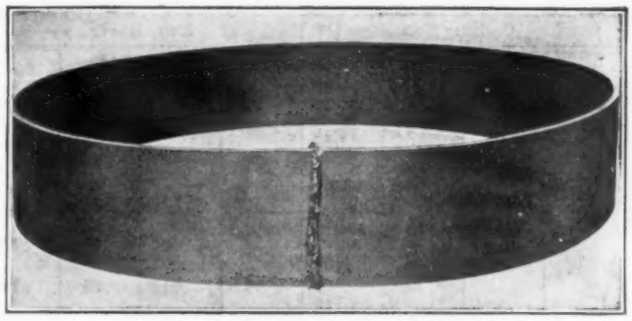


FIG. 379. A HEAVY WELDED RIM

machine can be set in a comparatively shallow pit to bring the line of weld on a level with the floor. This makes it possible, with proper tracking arrangements, to roll heavy rims right onto the lower dies without any lifting, the rim being rolled out again after welding. The double oil-transformers used in this welder hang below the base line, which necessitates a small pit directly under the center of machine. Owing to this and also the weight to be supported, a concrete foundtion only should be employed.

This machine has a capacity for stock ¾ x 8 to ¾ x 16 in., or a maximum thickness of 1 in. with a cross-sectional area of not over 7 sq.in. Rims with a minimum diameter of 30 in. can be welded. The pressure is effected by twin hydraulic cylinders operated from an external accumulator giving a maximum pressure of 24 to 37 tons on the work. The voltage windings are of the same capacity as for other machines. The transformer is of the oil cooled type, and the ratings are 160 kw. or 266 kva., with 60 per cent power factor. Primary windings of transformers are submerged in cooling oil contained in casings. Platens on which the clamps are mounted and the bodies of the lower jaws to which the contact shoes are bolted, are water cooled. This machine is 66 x 101 in. and 66 in. high. The net weight is 14,000 pounds.

A heavy rim after welding, is shown in Fig. 379.

Welding Pipe

In order to weld pipe and tubing in the form of coils for condenser systems cooling tubes, heating coils, etc., as shown in Fig. 380, it was found necessary to employ a special form of clamp wherein the jaws could be set

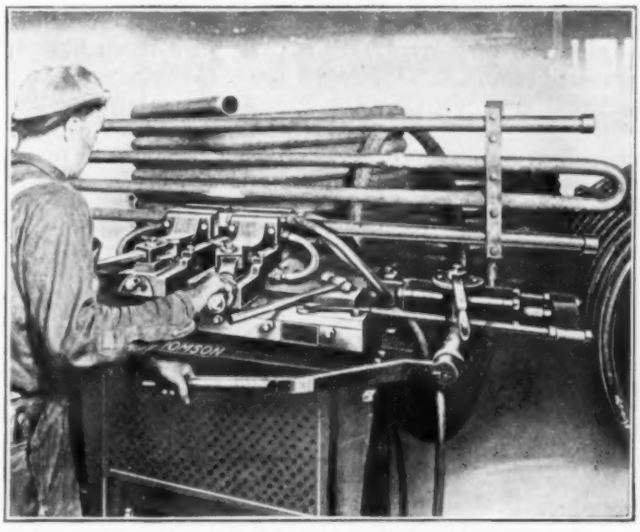


FIG. 380. WELDING PIPE COILS

Ordinary Sizes				Extra Heavy				Double Extra Heavy				Miscellaneous Data			
Diameters			Pipe Wall Thickness	Diameters			Pipe Wall Thickness	Diameters			Pipe Wall Thickness	Square Inch Cross-Section	Weight in Lbs. per Foot	Current Consumption per 1000 Welds	Cost per 1000 Welds at 1 c. per K.W.H.*
Nominal Internal	Actual Internal	Actual External		Nominal Internal	Actual Internal	Actual External		Nominal Internal	Actual Internal	Actual External					
⅛	.27	.405	.068									.0717	.241	12	$0.12
				⅛	.205	.405	1					.086	.29	13	.13
¼	.364	.54	.088									.1249	.42	16	.16
				¼	.294	.54	123					.161	.54	18	.18
⅜	.494	.675	.091									.1663	.559	19	.19
				⅜	.421	.675	.127					.219	.74	21	.21
½	.623	.84	.109									.2492	.837	26	.26
				½	.542	.84	.149					.323	1.09	35	.35
¾	.824	1.05	.113									.3327	1.115	37	.37
				¾	.736	1.05	.157					.414	1.39	50	.50
1	1.048	1.315	.134									.4954	1.668	60	.60
								½	.244	.84	.298	.507	1.7	70	.70
				1	.951	1.315	.182					.648	2.17	90	.90
1¼	1.38	1.66	.14									.668	2.244	100	1.00
								¾	.432	1.05	.314	.727	2.44	110	1.10
1½	1.611	1.9	.145									.797	2.678	130	1.30
				1¼	1.272	1.66	.194					.893	3.	160	1.60
2	2.067	2.375	.154									1.074	3.609	210	2.10
				1½	1.494	1.9	.203					1.082	3.63	220	2.20
								1	.587	1.315	.364	1.087	3.65	230	2.30
				2	1.933	2.375	.221					1.495	5.02	340	3.40
								1¼	.885	1.66	.388	1.549	5.2	360	3.60
2½	2.468	2.875	.204									1.708	5.739	410	4.10
								1½	1.088	1.9	.406	1.905	6.4	460	4.60
3	3.067	3.5	.217									2.243	7.536	570	5.70
				2½	2.315	2.875	.28					2.283	7.67	590	5.90
3½	3.548	4.	.226									2.679	9.001	740	7.40
								2	1.491	2.375	.442	2.686	9.02	760	7.60
				3	2.892	3.5						3.052	10.25	850	8.50
4	4.026	4.5	.237									3.174	10.665	940	9.40
4½	4.508	5.	.246									3.674	12.35	1150	11.50
				3½	3.358	4.						3.71	12.47	1190	11.90
								2½	1.756	2.875	.56	4.073	13.68	1300	13.00

* Multiply these values by the rate you are paying per K.W. Hour for current, to determine what the cost per 1000 welds for any size would be at your plant.

TABLE XXVII. APPROXIMATE CURRENT CONSUMPTION FOR WELDING PIPE UP TO 4½ IN.

up high to give clearance above the pressure-device. The thickness of the die and die-block to which it is bolted also had to be reduced to a minimum so as to insert the jaws between coils, since the pipe is coiled through each length and then another length is welded on, which in turn is coiled, and so on. In order to secure the best gripping effect with a comparatively light die, it is necessary to make this form of die considerably longer than those used in the other types of horizontal-acting clamps. Moreover, since there is not enough space in the narrow block to which the die is bolted to permit water circulation, the die itself must be water-cooled to prevent softening of the copper from continued contact with the hot pipe just in back of the weld.

This type of clamp, Fig. 381, is designed for welding of pipe and tubing only, which requires a much lighter pressure to push up than solid stock of the same cross-sectional area, and since the line of weld is considerably above the line of pressure, the slides will be quickly worn on the movable platen if heavy pressure is used continually. For this reason the welding of any solid stock with this class of machine is not advisable. The machine shown will weld iron and steel pipe from ¾ to 2 in. in diameter, ordinary pipe sizes and 1¼ in. extra heavy pipe, or double heavy 1 in. in diameter. Standard steel tubing from 1 to 2¼ in. diameter may be welded. Pressure is supplied by a hydraulic oil jack exerting a maximum of 5 tons. The standard ratings are 30 kw. or 50 kva., with power factor of 60 per cent. The machine will weigh about 2,500 pounds. For welding pipe, Table XXVII will be found useful for reference purposes. This table was compiled by the Thomson Electric Welding Co., with special reference to their machines.

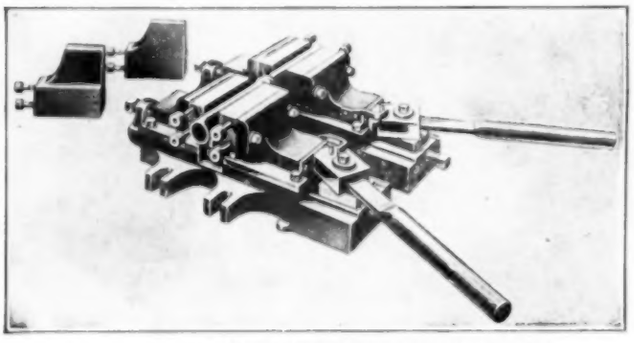


FIG. 381. CLAMP USED FOR PIPE WELDING

FIG. 382. WINFIELD PORTABLE BUTT-WELDING MACHINE

The Winfield Electric Welding Machine Co., Winfield, Ohio, makes a complete line of butt-welding machines but only a few representative of their line, will be shown. A very convenient portable or bench type is shown in Fig. 382. This is especially useful for light manufacturing work. It has a capacity of 18 to 6 gage wire. It is equipped with a 1 kw. transformer, hand clamping levers and a 3-step self-contained regulator for controlling the current. It occupies a floor space of 13½ x 16 in., is 35 in. high from floor to center of welding dies, and weighs about 130 lb.

Diameter of Stock	Area in Square Inches	K. W. Required	Horse Power	Time in Sec. Per Weld	Cost Per 1000 Welds at 1c per K. W. Hour	Average No. of Welds Per Hour	Labor Cost Per 1000 at 30c Per Hour
¼ Inch	.05	2	3	3	.02	400	.75
5/16 "	.08	3	4	4.5	.05	375	.80
⅜ "	.11	4	5	6	.07	330	.85
7/16 "	.15	5	7	6.5	.10	300	1.00
½ "	.20	6	8	7	.12	250	1.20
9/16 "	.25	7	9	7.5	.15	200	1.50
⅝ "	.31	8	11	8	.18	150	2.00
11/16 "	.37	9	12	9	.23	130	2.30
¾ "	.44	10	13	10	.28	100	3.00
13/16 "	.52	10.5	14	12	.35	95	3.20
⅞ "	.60	11	15	15	.46	90	3.30
15/16 "	.69	11.5	15.5	17	.55	85	3.50
1 "	.79	12	16	18	.60	80	3.70
1⅛ "	.99	16	21	20	.89	75	4.00
1¼ "	1.23	19	25	25	1.32	70	4.30
1⅜ "	1.48	25	33	30	2.08	65	4.60
1½ "	1.77	31	41	35	3.00	60	5.00
1⅝ "	2.07	38	51	37	3.90	55	5.50
1¾ "	2.41	45	60	40	5.00	48	6.20
1⅞ "	2.76	53	71	43	6.34	40	7.50
2 "	3.14	60	80	45	7.50	30	10.00

TABLE XXVIII. COST OF ¼ TO 2 IN. WELDS PER THOUSAND

The machine shown in Fig. 383 is for general all-round shop work. It has a capacity of from ¼ to 1 in. round, or ⅜ x 2 in. flat stock. It has a 25-kw. transformer, water-cooled welding jaws, enclosed non-automatic switch on upsetting lever, stop for regulating amount of take-up on each weld, ten-step self-contained regulator for controlling the current, occupies a floor space of 44 x 25 in., is 42 in. high to center of jaws and weighs about 1,800 lb. The jaws overhang as shown, for welding hoops, rings, rims, etc.

The machine shown in Fig. 384 is for toolroom work and was especially designed for handling large cross-sections. It will weld up to 2½ in. round. All clamping and upsetting operations are accomplished by means of air or hydraulic pressure. The clamping cylinders are operated independently of each other by means of separate valves, which enable the operator to clamp each piece before the current is turned on. The small air cylinder on the right-hand end of the machine keeps the work in close contact during the heating operation. The final pressure is applied by the hydraulic ram after the proper welding heat has been attained. The table at the left is equipped with adjustments for moving it up or down, back and fourth, tilting or twisting. This feature is especially valuable in experimental work and often saves buying a special machine for unusual manufacturing jobs. The terminals are cooled by a stream of water which flows from one to the other. The dies are held in place by slotted clamps which permit easy removal. Work stops and stops to regulate the amount of upset are provided. The movable table is fitted with roller bearings to insure easy operation. The transformer is a Winfield 125 kw. The machine has a ten-step current regulator, and the current for welding is controlled by a Cutler-Hammer magnetic switch which in turn is operated by means of a small auxiliary switch placed on the valve lever controlling the hydraulic ram. The floor space occupied is 60 x 90 in., and the approximate weight, ready for shipment, is 8,000 lb.

FIG. 383. A GENERAL PURPOSE BUTT-WELDING MACHINE

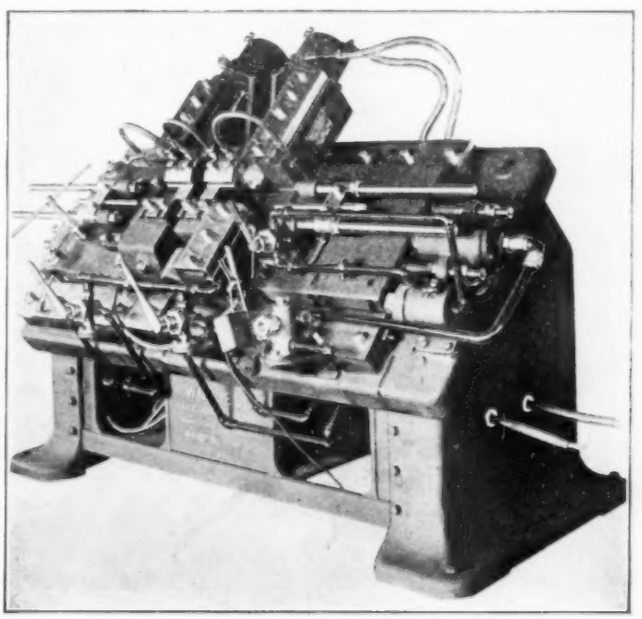


FIG. 384. WINFIELD TOOLROOM MACHINE

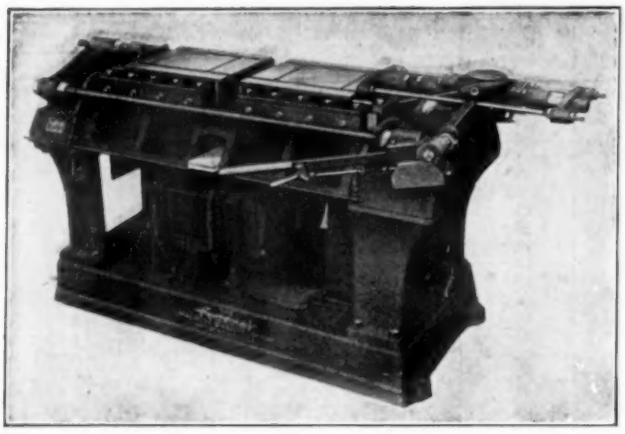


FIG. 385. FEDERAL HEAVY-DUTY BUTT-WELDING MACHINE

Table XXVIII compiled by this concern contains some useful data not given in the other tables.

The machines built by the Federal Machine and Welder Co., Warren, Ohio, do not differ in the principles of operation from the machines already described. The form of the one shown in Fig. 385, however, differs considerably from any shown. The tables, or platens, are flat and are T-slotted so that various fixtures may be easily bolted in place. The maximum capacity for continuous service, is 2¼ in. round or other shape of equal section. Flats up to ¾ x 10 in. may be welded. The platens are of gunmetal and the T-slots will take ¾-in. bolts. These platens are recessed and water-cooled. Pressure is applied by means of an hydraulic jack, shown at the right. The switch is remote control magnetically operated. The main switch is controlled by a small shunt switch which is worked either by hand or foot, as desired. The transformer is 100 kva. It has an eight-step regulating coil. Floor space occupied is 38 x 88 in., height 50 in., weight 5,600 lb. This machine is intended to weld auto-rims, heavy forgings, steel frames, shafting, high-speed steel and work requiring accurate alignment and rapid production in quantities.

A set consisting of a tube welder and roller, is shown in Fig. 386. This will weld tubes from 1¼ to 3 in. It will also weld flat, round or square stock of equivalent

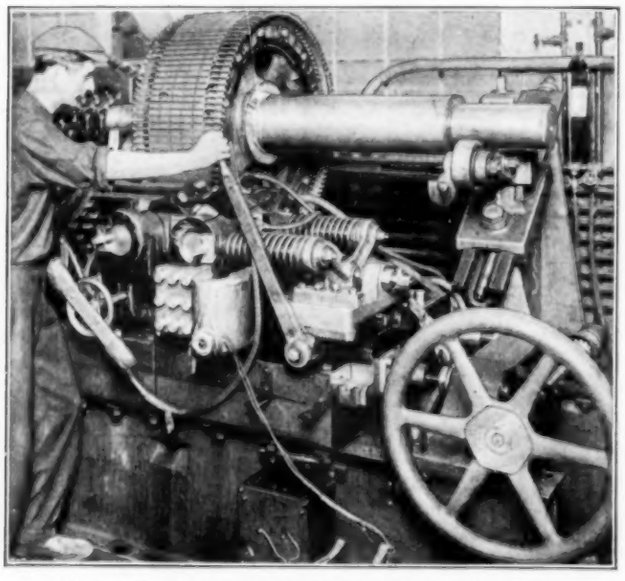


FIG. 387. GENERAL ELECTRIC MACHINE FOR ROTOR WORK

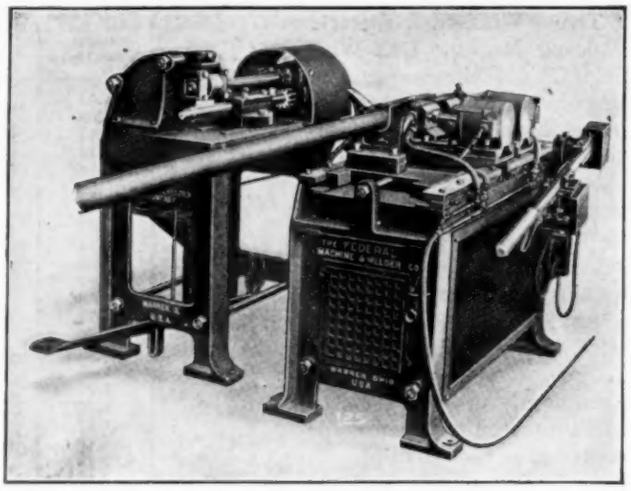


FIG. 386. A TUBE WELDING SET

cross section. The dies are water-cooled, and the work is clamped in position by air cylinders operating on a line pressure of 80 to 100 lb. The switch is on the main operating lever, so that the heat is at all times under the control of the operator. The transformer is 65 kw. air cooled. Eight current steps are obtained. The machine occupies a floor space of 30 x 51 in., is 42 in. high, and weighs 2,100 lb. By using the set, a tube may be welded and immediately transferred to the rolling machine and the flash rolled out. The time consumed in rolling down the flash on a 2¼-in. tube is given as approximately 20 seconds.

Butt-Welding Copper and Brass

In the *General Electric Review* for December, 1918, E. F. Collins and W. Jacob describe the welding of rotor bars to the end rings used in squirrel-cage induction motors, employing the machine shown in Fig. 387. This machine has a double set of welding jaws, the front set being used to butt-weld end rings to make them seamless, while the rear set is used to weld the rotor bars to the end rings. As shown, the machine is welding rotor-bars to the end-rings. The description of the

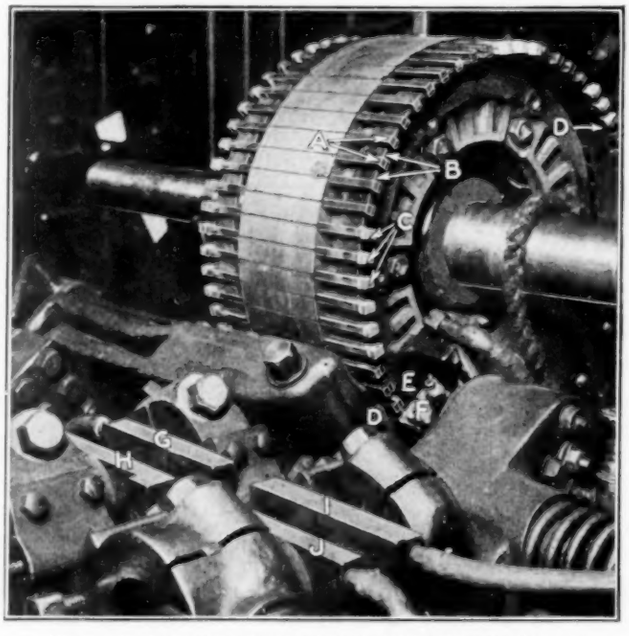


FIG. 388. DETAILS OF THE WELDING MECHANISM AND WORK

work as carried out in the General Electric shops is as follows:

"The projecting rotor bars surround a toothed end ring, which is of slightly smaller diameter than the rotor. A small block of copper is placed so that it covers the end surfaces of a rotor bar and the corresponding tooth on the end ring, after which it is butt-welded into place.

The projecting rotor bars are shown at *A* in Fig. 388 and the toothed end ring just inside the circle of rotor bars is shown at *B*. Finished welds as at *C* show blocks in place. The actual operation is as follows: A rotor bar is tightly clamped to the corresponding tooth of the end-ring between the jaws *D* and *E*. The copper-block end-connection is placed so that it covers the combined area of tooth and bar ends. The movable jaw *F* holds the end connection in place, and heavy pressure is then

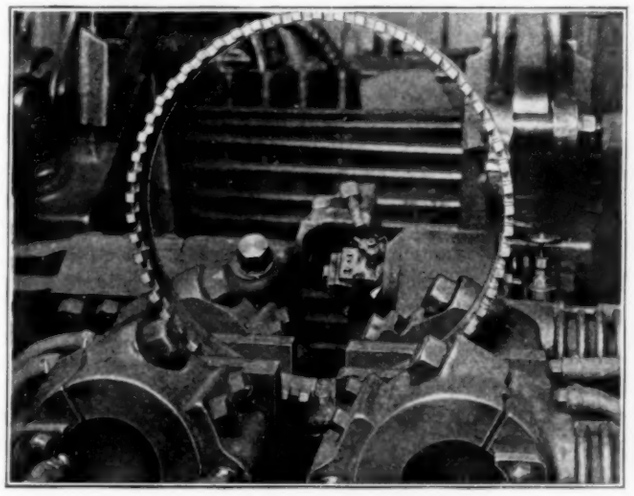


FIG. 389. BUTT-WELDING THE END RINGS

applied through compression springs. The welding current, furnished by a special transformer having a one-turn secondary, passes from jaw *F* through the surfaces and out through jaw *E*. This heavy current at low voltage causes intense heating due to the comparatively high resistance at the surface junction, and raises the temperature of the copper to welding heat, at which point the metal is plastic.

At this stage spring pressure forces the jaw *F* toward the rotor and squeezes out any oxide which may have formed between the welding surfaces. A small stream of water, playing upon the hot area, forms an atmosphere of superheated steam which prevents the formation of oxide and also guards against excessive heating of the copper. No flux is used in the operation as the mechanical squeezing-out of the oxide is sufficient to form a homogeneous connection between the two surfaces.

As the welding jaws approach one another when the metal becomes plastic, an electrical connection is automatically made which operates a solenoid-controlled switch that opens the primary transformer circuit. Thus the current is interrupted as soon as the surfaces have knitted together. The contacts of this automatic switch are placed one on each movable jaw, and are so adjusted that they are separated by the distance necessary for the jaws to approach one another in forming the weld and in forcing out the oxide. In this way, the end connection is butt-welded to the rotor bar and the end ring, forming a junction of great mechanical strength and low resistance.

Another example of non-ferrous butt welding is the making of seamless end rings, which operation is performed in the same machine. The operation is shown in detail in Fig. 389, which shows a finished end ring in place. One end of the ring is placed in the vise-jaws *G* and *H*, and the other is held in the opposite jaws *I* and *J*. As the jaws approach pressure is applied by means of the springs. In all other respects the operation is similar to that of welding the end connections.

Rotors up to 14 ft. in diameter are welded and Fig. 390 shows the rotor for a 1,400-hp. motor being welded.

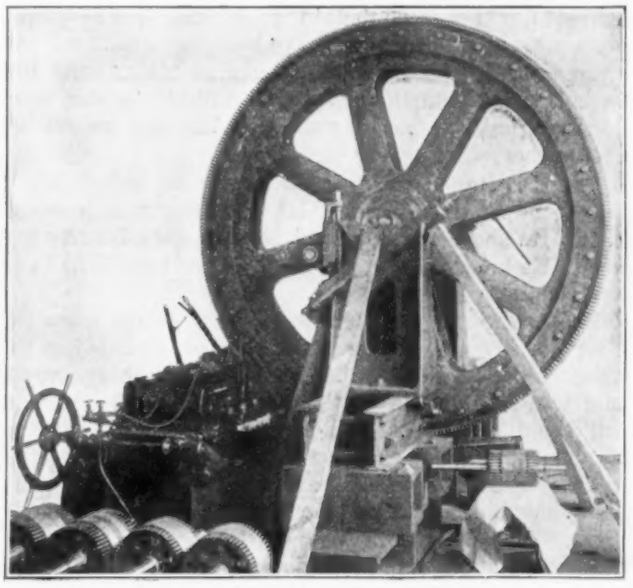


FIG. 390. WELDING END RING AND ROTOR BARS FOR 1,400-HP. MOTOR

The work is done rapidly; for example, end connections with a welding surface of about 0.6 by 0.4 in. are welded at the rate of about 90 an hour.

Welding Brass

Brass rotor bars and end rings are also butt-welded in a similar manner, but the operation is slower. Brass, being an alloy, has a lower melting point than copper, and less pressure is necessary to effect a weld. The pressure is determined by the thickness of the piece to be welded, and should be just enough to form a small "flash" at the point of union. Excessive pressure will cause the molten metal to spurt out from the point of weld.

In one fundamental particular the butt-welding of brass differs from that of copper, the pressure on brass must not be released after the stoppage of current until the metal has hardened sufficiently so that it will not crack on cooling. This delay retards the rate of welding to the extent that about 60 brass end connections, of the size previously mentioned, require the same time as 90 of copper.

Butt-welding has been the means of producing a rotor having low resistance, high mechanical strength, and ability to permanently withstand vibration and centrifugal force without excessive heating, all of which are essential factors in an efficiently operated squirrel-cage induction motor.

The Tin Dinner Pail Again?

By Entropy

Some few of the readers of the *American Machinist* undoubtedly remember carrying one of the old bright tin dinner pails with the little cup inverted over the cover. When you first opened it there was a piece of apple pie, or sometimes pumpkin, in a saucer and under that some cake and then several layers of sandwiches, that stretched your jaws wide open at every bite. Those were the happy days when no one worried over the cost of food. To be sure there was not much money in the pay envelope, but just think what you could buy with that little. Then there were not so many things to divert money from our pockets. Movies had never been heard of. If we wanted to go boating we borrowed someone's boat. He would have been insulted if we had offered to pay for it. There were no motor cars, but we could steer Old Dobbin very skillfully with one hand because there was nothing to scare him and we felt no need of haste.

The tin dinner pail was the mark of honest labor, not a badge of servitude. Its possessor was independent. He and his pail did not have to work for any one firm. He knew all parts of his trade and could fit in in any shop in a few days time.

Those who carry their dinners today do not know the tin pail. I doubt if one can be bought in any but the oldest stores. Now we are offered a leather covered box with a thermos bottle, and a little tin box that will hold about half the sandwiches that mother used to put in. We can carry hot coffee or cold coffee and be sure that we can tell which it is when we are ready to drink it, but we cannot carry a square meal any more. The alternative is to go to the shop cafeteria, or else to the one-arm-lunch down the street. The latter has had the drop on the lunch business until recently. We could get a good hearty meal for a quarter, topped off with a hunk of squash pie that alone would cost fifty cents today at any place along Broadway. We'll have to admit that the coffee was usually a very distant relative of the bean it was supposed to have come from, but there was enough of it, and by working hard all the afternoon we could sweat enough so that it did us no harm.

But today the one-arm-lunch proprietor has seen the great idea that the traffic will bear being squeezed some more and his prices look like the *à la carte* at the Biltmore of five years ago. He has been getting them too, but just recently it seems as though the time has turned, or better, possibly, the "worm" has turned and he sees more and more dinner boxes carried past his door every day. The shop cafeterias have variously met the situation by raising prices or by overlooking deficits. With the change in attitude what ought they to do? Just what is it worth to have men well fed, and how much is the loss if they are overfed?

First of all, we know that we are in the midst of a period of unrest; we also know that in an animal the easiest way to overcome unrest is by the application of music and plenty of food. Gorge the wildest man in captivity on the two and he is ready to lie down and go to sleep on the job without the slightest fear of work. The greatest trouble is that there is only one meal of the day that can be controlled by the employer, and that in the middle of the working period. The men may come in in the morning ready to fight at the drop of a hat, because of the night before or the scarcity of breakfast on the table. At noon he can be soothed and lulled into any state of mind that the dietitian sees fit, and at night we fear that his wife and children may suffer if he does not get equally well fed.

There is little doubt but that a man's ability to work and his disposition to work can be very largely controlled if his food can be controlled. The much railed-at McAdoo dinners of the time of the railroad administration were timed and weighed to the last degree of perfection. If every course was eaten they lasted a man with a healthy appetite up to about half an hour before he reached his destination. If the train was only half an hour late there was no real discomfort. They also had more or less of a soporific effect, so no matter how much we said about them before, and some time after, there were two or three hours in which the passengers were reasonably good natured.

The same thing can be done and improved on in the shops, provided the management is far sighted enough to realize that there are profits which the cost department cannot see. A diet can undoubtedly be arranged for every condition of climate and temperature, and for every variety of work, so that men will just begin to need food when the whistle blows. The mid-day meal could almost be given free if the men would follow the lead of a sensible dietitian. It would be interesting to know just how much of an undertaking it would be to get proper breakfasts and suppers served at home. My guess is that if the company were to offer wholesale rates on retail quantities of the foods which were selected it would be very easy to get almost every one in line. There is nothing that appeals to the retail buying public (now voters) more than a bargain. It would not do to advertise that these foods were good for one.

Never suggest that. Just suggest that they can be had at cut rates and not more than a limited supply to anyone.

Of course the success of this scheme would depend on the sagacity of the dietitian. There is no use offering anything on the score of its heat values. Most of us don't know what it means. I had the "pleasure" of dining for several months steadily at the restaurants of a chain which was once considered low-priced. They put on their menu the number of calories which each serving would afford. Time and again I have seen hot, heavy, not to say fat, men sit down in the middle of the day and the middle of the summer and pick out their orders to get the most calories per dollar expended, when if they had the slightest idea of what they were doing to themselves they would have ordered a bowl of crackers and milk and cooled off instead of stoking all the heat producing food that their pocketbooks would allow.

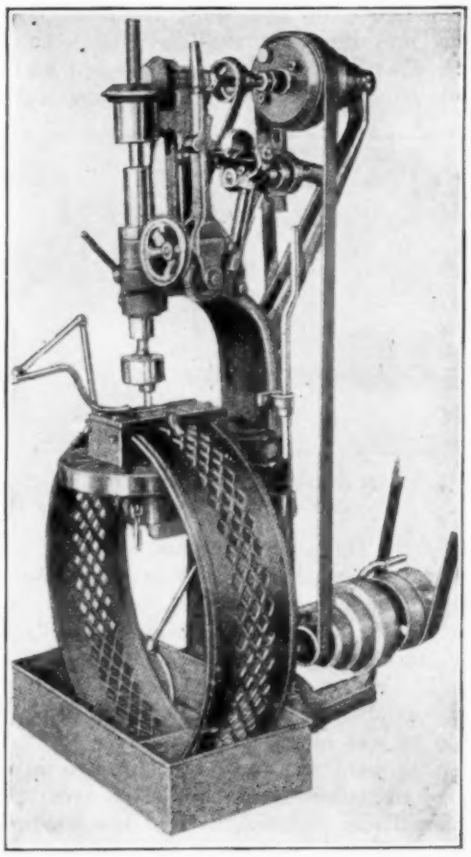
A good dietitian is one who can balance the needs of the day and the man and yet give him something appetizing and refreshing. A man who eats a hearty meal of red meat in the middle of the day needs a full noon hour and a pipe to be ready to get to manual labor. Then if he works hard enough he may come out even, but the man whose hardest duty is to adjust a micrometer screw every few hours cannot help being sleepy all the afternoon. He is the man that walks off platforms in bright daylight, and lets machines run idle because the stock is not renewed, and in many ways makes himself expensive for half the afternoon.

Drilling Angular Holes in Tire Mold

By J. Bainter

A rather interesting and unusual machining job recently came to the writer's attention. The illustration shows one type of mold ring used for forming the treads of automobile tires. This ring is of mild steel, 7/16 in. thick, and 210 diamond-shaped holes are required in it. The machining of these holes was a slow and difficult job and several methods were tried.

It was found best to drill the holes, using an angular drilling tool, the set-up being shown in the accompanying illustration. The tool, which was made by the Watts Bros. Tool Works, Turtle Creek, Penn., was driven by an upright drilling machine of the ordinary type and was found to be well suited to the job. The machining time was cut from 260 to 50 hours per ring. Tools of this type would certainly prove to be timesavers on other jobs, as they are adapted to drilling holes of various shapes—such as, say, the hexagon holes in socket wrenches.



ANGULAR DRILLING TOOL MACHINING A TIRE MOLD

Finish Turning Some Heart-Shaped Cams

By E. A. Dixie

In Fig. 1 is shown a shrouded heart-shaped cam which was made several years ago by a friend of mine. A number of these cams were required, so dies were made to punch the heart-shaped centers out of sheet steel about 1/8 in. thick. As there is nothing out of the ordinary about the diemaking end of this job it will not be described here. The method of laying out the heart was obtained from the *American Machinists' Handbook*. After the die was made it was found that the edge of the cam was not smooth enough for the purpose to which it was to be put and the question arose whether the blanks should be shaved in another punch-press operation or the work form-turned to the desired

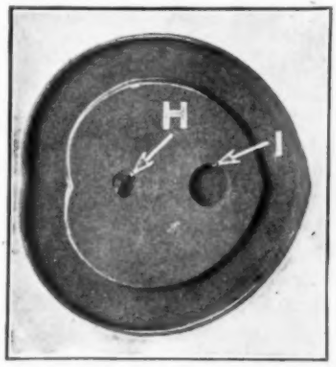


FIG. 1. SHROUDED HEART-SHAPED CAM

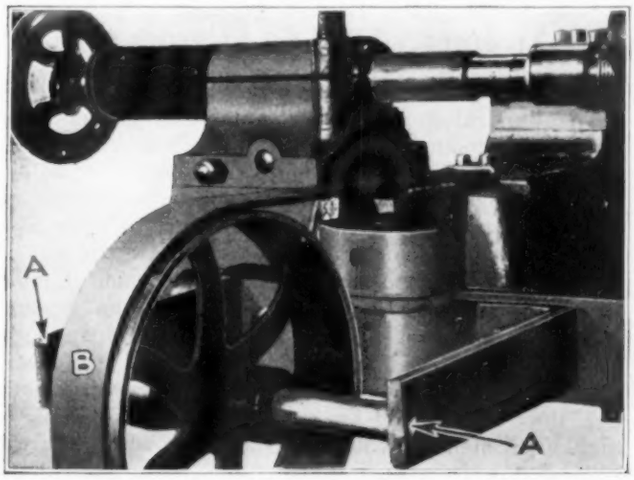


FIG. 2. RIG FOR TURNING THE HEART-SHAPED CAM

degree of smoothness, which was finally settled in favor of the turning operation. Figs. 2 and 3 show how the work was done on a small engine lathe rigged up for the purpose.

Two brackets *A*, Fig. 2, made of flat iron, were bolted to the back of the lathe carriage. They carried the cast-iron pulley over which the belt *B* for the counterweight led. The screw was removed from the cross-

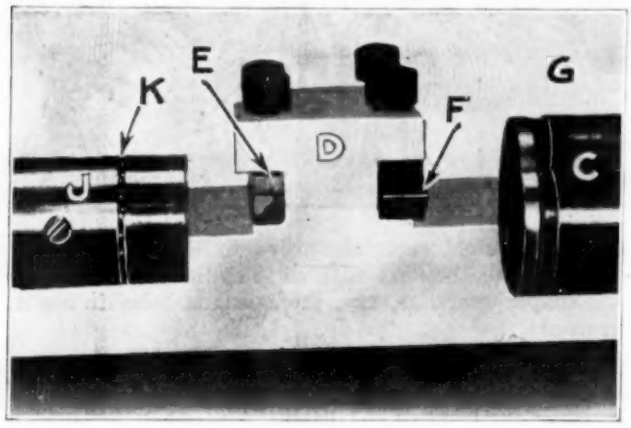


FIG. 3. CLOSEUP VIEW OF THE RIG

slide so that it was free to follow the contour of the master cam *C*, Fig. 3. A special toolpost *D* was made to carry a turning tool *E* and the cam follower *F*. The cam blank was secured to the face of the hardened master cam which was provided with a taper shank to fit the hole in the live spindle.

Only one hole *H*, Fig. 1, was required through the cam for affixing it to the mechanism in which it was used, but to locate it and to prevent it from moving during the finish-turning operation another hole was drilled as shown at *I*. A special tail center *J*, Fig. 3, was also made and provided with a ball thrust *K* which when in operation abutted against the cam blank and kept it from coming off the locating pins.

The accuracy demanded was within 0.0005 in. The time necessary for turning about was 30 seconds each. Over 500 had been turned, up to the time the photographs were taken, without any change of the tools.

The job of turning was so simple that an apprentice boy did it.

The shrouding around the periphery was made of thin sheet steel and riveted on.

An Interesting Old Micrometer

By Wm. Older

The illustration shows an interesting old micrometer that a toolmaker friend of mine found some ten years ago lying on top of one of the beams in an old machine shop. How long it had been there none of the older hands knew, and no one seems to know who made it. It is made to take a little over two inches.

It will be observed that the man who made it must have calibrated the screw before he cut the graduations on the barrel for the line runs at an angle to compensate for the shortness of the lead of the measuring screw. The small stem which looks very much like the ratchet stop on a modern tool is merely a high-speed stem provided with a screw which fits the end of the thimble. When found, the micrometer had in place of the anvil a piece of cork, and thereby hangs the tale that accounts for the appearance of the picture in the *American Machinist*.

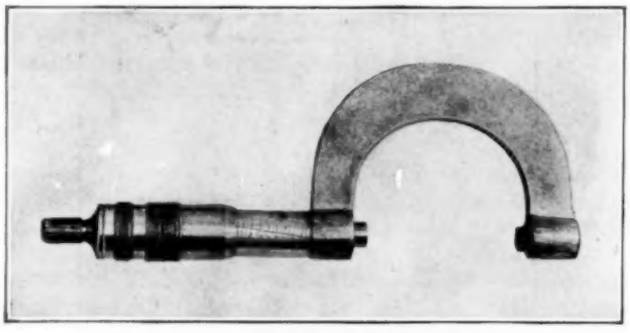
My toolmaker friend and I were swapping yarns the other day. These, as they always do, led from one thing to another till we got to the ever-popular "War Toolmaker" when my friend spilled the following:

"I was working at So and So's in 1917. We had a few good mechanics but the rest were the hardest bunch of lunkheads I ever saw. One day a fellow blew in and asked for a job. When asked what he could do, he said he had worked at Jones' shop as a toolmaker, at Brown's as a gage maker, at Smith's as a die maker, etc., so as we were in need of men no matter how little they might know if only they could do some one thing, the boss gave him a job on the cylindrical grinding machine.

"The first job given to him was to grind the outside diameter of some rough-forged rings. There was nothing particular about the job—anything within $\frac{1}{64}$ in. was quite good enough.

"After he had fussed around a bit at a job he came over to me and wanted to borrow a two-inch micrometer, giving as an excuse that his tool chest had not arrived yet. I would not have trusted him with any of my good tools but I remembered about the old two-inch "mike" in my chest so I took it out with every appearance of care and told him to be very careful with it as I was working to a "tenth" with it on certain work and had it very accurately adjusted.

"When I handed it to him I wondered how long it would be before he found out that the thing was nothing but a piece of scrap. A few minutes later I saw him try it on one of the rings, carefully turning and turning the barrel and then turning it again. Between every turn he would swing the 'mike' over the work to get the 'feel' of the work between the end of the screw and the cork anvil. At last he had run the screw down as far as it would go, so he withdrew the screw and went through the same antics with



AN OLD MICROMETER WITH A COMPENSATING SCALE

another of the rings which he had already finished and taken out of the machine. A little while later he came over to me, handed me the old 'mike' very carefully, thanked me for lending it to him and said: 'I guess I better get on my coat and quit; I got all those rings too small.' However, I suggested that he grind up the rest anyhow, as he might as well spoil the whole lot while he was about it.

"When he went out for lunch I measured the rings and found that they were about $\frac{1}{32}$ in. over size instead of too small; he had not noticed the compressing of the cork anvil and so thought that he had made them too small."

WHAT to READ —for the man in a hurry

Suggested by the Managing Editor

THIS week's leader gives a brief account of the steps leading to the passing of the act creating the Court of Industrial Relations of the State of Kansas. The action of Governor Allen and the Kansas Legislature caused something of a stir at the time the bill was passed, but little has been heard from that vicinity lately except at the time of the Allen-Gompers "debate" in New York. Nevertheless the court is still working although one of the provisions of the original bill has been declared unconstitutional on what appears to a mere layman as a legal quibble. The statement has been made that it will be a very simple matter for the next legislature to amend the act to take care of the weak point. It is to be hoped that the steps necessary to remedy the defect will be taken so that the court may function as originally intended and receive a fair trial.

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots

Toolmakers, designers and foremen will be interested in an ingenious fixture for milling small ellipses on a production basis, which is described on page 752 by P. A. Fredericks. Full details of the fixture are given.

Beginning on page 755 we have a history of the art of brass-making written by Otis Allen Kenyon for the Bridgeport Brass Co. We were so impressed with the excellence of the story that we arranged to reprint the whole thing for the benefit of those of our readers who do not happen to be on the mailing list of the company. The first installment is devoted to historical notes and is confined mainly to the description of methods and equipment of bygone days.

This article is followed by another shorter one for the toolmaker in which Fred Colvin tells of some small-scale press and die work.

The men who build and keep up the linotype machines on which the *American Machinist* is printed must be thorough mechanics, and specialists on this particular work besides. How they are trained at the factory of the Merganthaler Linotype Co. is discussed by J. V. L. Morris beginning on page 765. More of R. Thomas Huntington's amusing reminiscences follow the apprentice article. Here he tells of his first shop, probably the oldest locomotive shop in this country. In those days the machining of side-rods was a man's job on the machine tools available.

Little can be said about Part XXX of the Welding Series except that it covers electric butt-welding machines and their work, in Viall's usual thorough way. Performance and cost tables are included.

Our old friend Entropy is on the job again this week taking for his theme the "carry-your-own-lunch" slogan that has had no small effect on restaurant lunch prices in many cities of late. Among other things, what he has to say about the McAdoo standardized railroad dinners will appeal to those of you who had to do much traveling during the régime of the late lamented (?) R.R. administration. Entropy has page 778 all to himself.

We have been keeping our engineer readers closely in touch with the affairs of the Federated American Engineering Societies. This week the federation is given space in three parts of the magazine. A list of additional societies joining is given in the news section on page 788g; there is a general article, page 783, which briefly outlines the reasons for an organization of engineering societies and tells of the large field open to its activities; there is also an editorial, page 782. The general article consists of excerpts from addresses by the presidents of two national engineering societies and we are certain that you will profit by reading it.

"Sparks" has accounts of several meetings and conventions that have just occurred, of major importance being the Foundrymen's convention at Columbus and the annual meeting of the American Manufacturers' Export Trade Association in New York. We are also running the chart of the exhibitors at the Olympia machine tool exhibit that was prepared for our European Edition and with it some British comment on both Olympia exhibit and the Leipzig fair. See pages 788a, b, and c. On page 783 is an account by our technical correspondent in Washington of the hearings before the Federal Trade Commission on the subject of the guaranteeing of retail sales prices. This is a big question.

EDITORIALS

A Permanent Tribunal for Labor Troubles

EVERY once in a while the much-pestered public worm turns and takes a vicious wallop at its tormentors. Out in Kansas last winter the coal miners struck once too often and the State took hold and showed them that coal could be obtained in spite of mighty labor leaders.

It really is surprising how much the common people will stand before they make up their minds to do something. If we are not mistaken there were something like seven hundred strikes in the Kansas coal fields in a little over four years and most of them over the most trivial matters. The water in the shower baths was too hot, or else it was too cold, the dynamite was the wrong color, a steam shovel was put in to save money in a strip mine, the pipe-fitter was busy somewhere else and consquently a water pipe joint could not be broken to enable a machine to keep up with the gang; the gang quit rather than unscrew the joint. These are only a few typical cases and were usually local. The strike which caused the trouble was the big one for a 60 per cent increase and shorter hours and weeks.

Most of our big strikes have been settled by a specially appointed commission and the public suffered while the commissioners familiarized themselves with the facts in the case. Governor Allen and the people of Kansas have taken the stand that a permanent commission or court will be better able to handle such cases and the country is watching their experiment with keen interest.

The platform on which the Kansans stood, and still stand, maintains that the public has rights in any dispute between capital and labor in any of the essential industries. This seems to be a rather novel idea to some people and created a storm when Governor Allen proposed his Industrial Court to insure the preservation of these rights. K. H. C.

The Federated American Engineering Societies and Its Field

THERE is an immense field in which the Federated American Engineering Societies can carry out its avowed object of furthering the public welfare wherever technical knowledge and engineering experience are involved. Individual societies have long recognized the existence of big problems concerning the welfare of the nation and have done what they could to solve them. The effects of such efforts have been two-fold—beneficial to the nation in practical results and educational to the society in making it see that for great accomplishment engineers must act as a unit.

Following the rapid crystallization during the war of the sentiment favoring united action there was organized the Federated American Engineering Societies. There has been some speculation as to just what the Federation can do. Part of the answer was contained, though it probably was not intended to be such, in the address of Herbert C. Hoover, president of the American Institute of Mining and Metallurgical Engineers at Minneapolis, an excerpt of which we publish on page 788d. Though only a part of the answer it is a large part, enumerating problems of national scope on which the Federation can be at work for some years to come.

Mr. Hoover's address is preceded by an excerpt from an address by Arthur P. Davis, president of the American Society of Civil Engineers, at the annual convention in Portland, Oregon. Mr. Davis outlined the necessity for and the organization of the Federated American Engineering Societies.

We believe, with Mr. Hoover, that certain things must be done—and with Mr. Davis that we must have united action of engineers to do them. Conservation of raw material and scientific and common-sense management must be practiced in the business of the nation as they are in the business of private plants. Believing that the Federated American Engineering Societies offers the best present constructive step toward fructifying such aims, we continue to urge that engineering societies join the Federation and take part in the forward movement. L. C. M.

Increasing the Efficiency of Our Congressional Committees

IT IS unfortunate, but true, that the results obtained from the average Congressional investigation are seldom commensurate with the effort expended. The blame should not be laid at the doors of the committee members from House or Senate, for they are working under conditions that practically preclude any other outcome. Few members are so situated that they can attend every meeting of every committee on which they may be serving. And in addition even fewer members have the necessary technical knowledge to make an intelligent investigation into each of the many widely diverse problems to be handled.

A practical remedy was suggested by Otto H. Kahn in a talk on the general subject of taxation before the American Manufacturers' Export Association. It was well received by his audience and is well worth serious consideration. The suggestion is that committees be made to include both legislators and citizens, the latter to be disinterested experts of recognized authority on the particular matters to be dealt with by the committee. According to Mr. Kahn's plan the citizen members would be in the minority, and this is probably as it should be, especially from the practical standpoint of securing enough men of the proper caliber.

Many business men and many engineers have been free in their criticism of the politician and country lawyer types of congressman, but have done nothing to send better men to take their places. And probably they never will. Hence the practicability of a plan of this kind that will attain the end sought without attempting the impossible feat of changing human nature

K. H. C.

Guarantee of Prices Against Decline

By R. S. McBRIDE
Washington Engineering Representative, McGraw-Hill Co., Inc.

Can the manufacturer or jobber properly guarantee his customer against declining markets? This is a question which the Federal Trade Commission had under consideration at its hearing in Washington during the week of Oct. 4. Many industries from all parts of the country were represented and a wide variety of opinion was evidenced.

AS STATED by the chairman of the Federal Trade Commission the subject of giving guarantees against price decline has many ramifications extending all the way from cranberries, a most perishable article, to structural steel, which even the most ardent advocates of the theory of corrosion by electrolysis cannot consider a perishable commodity. The practices of industries differ as widely as the commodities handled. For example in certain lines absolutely no guarantees of this type have ever been granted and the industry apparently vigorously opposes any opportunity for beginning the practice. On the other hand unlimited price guarantee is practiced in other fields, even to the extent of protecting the dealer with respect to the stocks on hand at the time of any decline, without regard to the time of purchase or the magnitude of the decline.

Some of the problems to be considered by the commission are as follows:

(1) Over what period of time should the guarantee extend?

(2) Should the date of determination be definite as is the practice in the case of seasonal goods or should it be based upon the time after delivery, or should the guarantee terminate with delivery and, therefore, apply only to unfilled portions of contracts?

(3) Should the guarantee extend only against decline in the price made by the seller himself or against any decline in the market made by competitors?

(4) Should the decline be limited to those commodities which are handled on a basis of publicly known prices to the consumer, or can the practice also apply to a commodity where the price involved in transactions and the price to the consumer are not generally known to the trade?

(5) Should the guarantee apply to the goods actually on hand at the time of the decline or to all goods sold to the jobber under the contract, thus permitting the jobber to afford a similar guarantee to the retailer on the goods which the retailer still has in stock?

Arguments Against Permitting Guarantees

Some of the arguments advanced against permitting continuance of price guarantees are set forth by the communications which have been presented to the commission in answer to its recent questionnaire. Among these the following claims are most conspicuous:

Results in unfair competition and is equivalent to a form of rebating.

Leads manufacturers to encourage dealers in overstocking thereby eliminating their competitors.

Puts a hardship on manufacturers with small capital.

Gives jobbers an unfair advantage in relations with manufacturers.

Encourages jobbers to take too great risks as to probable sales, that is, encourages overstocking.

Creates speculative buying.

Creates a disadvantage as between large and small jobbers, the former being able to secure concessions which are denied the latter.

Tends to maintain an artificial level of prices, that is, eliminates much of the incentive for manufacturers to reduce prices.

Delays passing of market declines on to the consumer.

Injures small operators who cannot successfully maintain businesses when this speculative element remains.

Imposes a hardship upon the seller by requiring him to bear the risk which the jobber can reasonably be expected to carry.

Leads to overstocking of perishable products and thereby increases wastage or results in inferior quality reaching the consumer.

Compels a producer to use the practice in order to meet other producers, even though he believes the practice vicious.

Creates an expense to the manufacturer in the form of increased risk which he necessarily adds to his price and which the consumer ultimately pays.

Suppresses competition.

Prevents producers from offering lower prices than specified in previous outstanding contracts.

Encourages violently changing prices at the close of guarantee periods instead of normal, gradual price adjustments at intervals throughout a period of guarantee (particularly in seasonal commodities where the price guarantees expire at a given date).

Arguments Favoring Price Guarantees

Proponents of the idea, who insist that this trade practice is legitimate, necessary and in the public interest, offer among others the following arguments with respect to guarantee against price decline:

Encourages freer purchase and carrying of normal stock.

Enables manufacturer to maintain regular and continuous factory operation and shipment throughout the year.

Saves delays in delivery by distributing shipments over the year.

Permits manufacturer to anticipate his needs for raw materials and to buy on a less fluctuating raw material market.

Tends to stabilize business.

Creates business confidence.

Enables jobbers to anticipate their needs without undue risk.

Gives the manufacturer more accurate knowledge of his probable sales.

Induces the buyer to stock up, especially on seasonal merchandise, for considerable periods.

Steadies plant operation and therefore the employment of labor.

Permits wide distribution of stocks which simplifies distribution instead of concentration at the factory until demand arises.

Prevents abnormal demand creating shortage and abnormal high price because of wide distribution of stocks.

Prevents inadequate production at slack periods with the resulting subsequent shortage at seasons of greater demand.

Permits commodity to be sold by jobbers on narrower margin of profit.

Increases the percentage of car-lot shipments as compared with small shipments to meet current demands.

Justifies storage space in jobbers' warehouses, eliminating the necessity of large central warehouses at points of manufacture.

Prevents manufacturers from selling direct to retailers at lower prices than jobbers are able to quote.

Places the risk on the man who is best able to judge the hazard, that is, the manufacturer.

Gives the manufacturer read, use of his money and exempts him from payment of storage charges and expense.

Enables small retailers to carry adequate stock and thus pass the benefit to the consumer.

As a rather negative form of argument in favor of the guarantee practice it is urged that such guarantees do not in any way interfere with the functioning of the laws of supply and demand. It is insisted that no unfair or improper practice need follow and that the practice is nothing but one element in the matter of contract between buyer and seller of commodity.

Points of View Considered

In receiving these arguments and in the conduct of its hearings, the Federal Trade Commission has indicated that it will take into account the interests of the manufacturer, wholesaler, retailer, and consumer. It is considering the matter not alone from the point of view of the public service aspects. The matter of business relations, the law in the case, the question of justice between various merchandising interests and the principles of economics all were stressed by the various speakers and by the questions put to those appearing before the commissioners.

Unfortunately much of the discussion has not distinguished clearly between the differing conditions existent in different industries. Many of the generalizations presented before the commission, therefore, appeared much broader than was apparently intended by their proponents. Because of this it is difficult to draw any general conclusions as affecting all industries. Nevertheless certain outstanding features of the discussion seem to have been well established and can safely be used as a guide to the present thought in the matter.

It is worth while at this point to note that the Federal Trade Commission expressed its desire to receive additional discussion or briefs in the matter from any interests including those which have not previously been heard. This privilege was extended for a period of thirty days from the time of the hearing, Oct. 5 and 6.

Some Conditions Indicated

Even the strongest opponents of a price guarantee system did not deny that there are certain industries and certain circumstances in which guaranteeing against price decline offers certain commercial merit. It also seemed to be the unanimous opinion that if price guarantees are to be permitted in American trade there should be no effort whatsoever to make price guarantees mandatory. And, too, those in favor of having price guarantees permitted did not deny that under certain circumstances such might conceivably be used unfairly and constitute, therefore, unlawful practices in defeat of competition or in restraint of trade.

A number of the arguments which carried the greatest element of conviction related specifically to particular industries. For example, industries dealing with products of seasonal demand or seasonal production have established practices that seem to contribute uniformly to the benefit of producer, jobber, retailer and public.

The rubber footwear trade, which meets with a seasonal demand analogous to that in the electrical appliance industry where Christmas or other specialty goods are concerned, stressed the necessity of wide distribution at all seasons of the year in order to permit reasonably uniform production and transportation in advance as well as during seasons of large consumption. The canned milk and food industries where seasonal production enters as a large factor made a similar case in favor of advance sale with guarantee against price decline for the wholesaler so that certainty of plant operation and movement of goods would permit intelligent planning by the packer.

Another type of industry argued for opportunity to guarantee against price declines on orders which are necessarily taken long in advance of the times of delivery, the factory output being contracted for months in advance even under present market conditions. These and similar circumstances indicate a likelihood that insofar as business relations and the general public interest are concerned we can expect an attitude favorable toward price guarantees of this sort on the part of the commission.

Law An Important Question

The law in the matter, however, must be considered as an important question which will really determine the form of the commission's decision when it is announced. It is argued pro and con that the commission may or may not regulate trade practices on the ground solely that they may tend to restrict competition or may tend to interfere with free competitive trade. A decision of the courts affecting this point relates to a case in which it was decided that the law forbade any practice which had a dangerous tendency to unreasonably restrict competition. This type of decision, however, is not particularly significant as it leaves an uncertainty as to what is a "dangerous" tendency and what is an "unreasonable" restriction.

Unquestionably the commission has authority and presumably will exercise it in specific cases where definite evidence can be afforded of the use of a trade practice, such as the guarantee of prices against decline, for the injury of a competitor. So long as this possibility exists it can be expected that the commission will from time to time hear particular cases where this is the ground for complaint and if a good case is made will doubtless order a discontinuance of the practice of such guarantees.

Benefits to Consumer or Wholesaler

It seems to be clearly indicated by testimony that in certain industries the benefit of price declines afforded by manufacturers to jobbers, when the market changes, are passed on all the way to the ultimate consumer rather promptly in a considerable portion of the business. On the other hand, it seemed to be clearly demonstrated that in other industries or other circumstances the guarantee against price decline resulted simply in a wider margin or in elimination of hazard to the wholesaler. The length of time over which the guarantee extends and the degree of publicity or secrecy in announcing price changes seem to be determining factors in this matter.

The results of the commission's consideration of this subject will appear not only as a report or perhaps opinion on the general matter but also more definitely in connection with the numerous cases now pending where specific complaint is made against guarantee of prices. A number of these cases lie in the field of canned goods, soap and similar products, but the principles there considered will, of course, be applicable in all lines of trade.

SHOP EQUIPMENT NEWS

-Edited by-
S. A. HAND

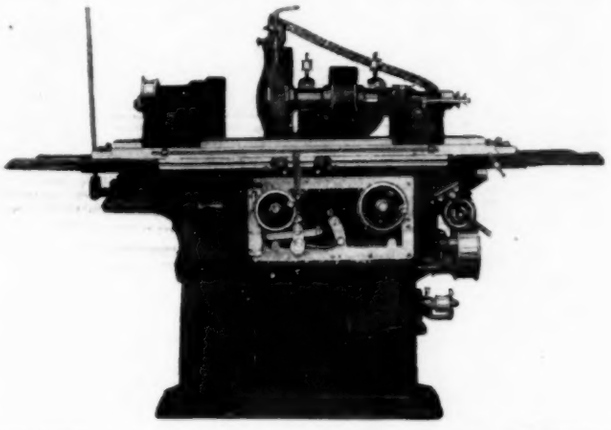
SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Webster & Perks Plain Manufacturing Cylindrical Grinding Machine

The Webster & Perks Tool Co., Springfield, Ohio, has added to its line the plain cylindrical grinding machine shown in the acompanying illustration. The machine is intended for manufacturing work on either straight or tapered stock held on centers, and it resembles in general features the universal grinding machine built by the company and described in the *American Machinst* of Jan. 31, 1918.



WEBSTER & PERKS PLAIN MANUFACTURING CYLINDRICAL GRINDING MACHINE

Specifications: Capacity; normal, 6 x 30 in.; maximum, 10¾ x 32 in. Swivel table graduations up to 3½ in. per foot. Headstock spindle; diameter, 2½ in.; hole, No. 2 Morse taper; length of bearings, front, 3¼ in. tapered rear, 3 in. Wheel spindle, 1¾ x 22¾ in. Wheel; face, 1½ to 2 in.; diameter, up to 14 in. Length of table ways, 50 in. Water tank capacity, 25 gal. Horsepower, 5. Wheel speeds, 1,680 and 1,920 r.p.m. Work speeds, 4, from 48 to 192 r.p.m. Table speeds, 8, from 6 to 94 in. per minute. Reduction by automatic crossfeed, minimum, 0.00025 in.; maximum, 0.005. Floor space; 43 x 116 in.; with unit countershaft, 66 x 116 in. Weight; net, 3,900 lb. with overhead countershaft, 5,050 lb. with unit countershaft; shipping, 4,300 and 5,650 lb.; boxed for export, 4,700 and 5,900 lb., respectively. Export box, with overhead countershaft, 49 x 60 x 80 in.

The bed is fastened to the base by means of capscrews, and its ways are provided with roller oilers for the purpose of lubrication. The length of travel of the table is controlled by means of adjustable dogs. Reciprocation of the table is automatic, the motion being transmitted through spur gears having a speed reduction ratio of 64 to 1. The table can be operated by hand also. The swivel table mounted on the sliding table can be swung by means of an adjusting screw.

The chrome-nickel steel headstock spindle is driven by inclosed gears with a speed reduction of 2½ to 1. Either live- or dead-center grinding can be done. The tailstock is provided with a spring center, and it carries the wheel-truing device. The wheel stand is held in place on the ways by its own weight. The wheel spindle is mounted in alloy bronze bearings held in ball-and-socket-housings,

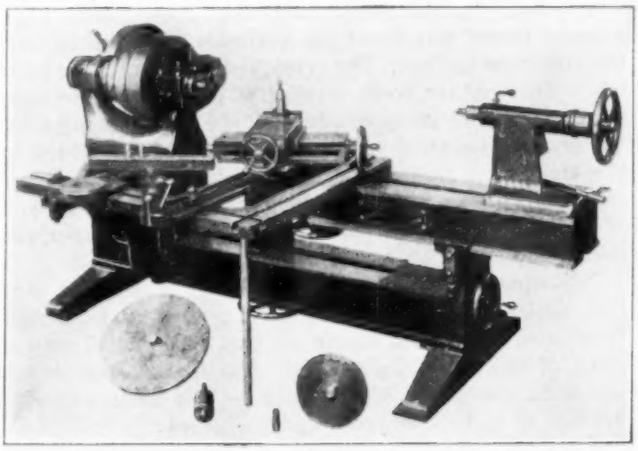
The rates of table feed and work speed can be independently varied. The headstock can be stopped without stopping the countershaft. The automatic cross-feed is provided with a micrometer adjustment and a positive stop. The controls are grouped at the front of the machine, the mechanism being assembled in a unit placed in the bed.

Provision is made for wet grinding, a Fulflo centrifugal pump providing the circulation. Two types of countershaft can be furnished, one for overhead use, and the other to be mounted on the floor in the rear of the machine and as a part of it. The countershafts are provided with Hyatt roller-bearings. Complete equipment is furnished with the machine.

Pryibil Extension Spinning Lathe and Attachments

The spinning lathe shown in the illustration has recently been built by the P. Pryibil Machine Co., 512-24 W. 41st St., New York, N. Y. It is intended for the spinning of articles of large dimensions, such as copper utensils for restaurant kitchens.

The machine is of the extension-bed type, its members having box sections. The main bed carries the headstock and supports the upper bed. The headstock is provided with a cone pulley for belt drive, and it is equipped with back gears. The front bearing of the



PRYIBIL HEAVY-DUTY EXTENSION SPINNING LATHE

Specifications: Swing, 27 and 60 in. Height of spindle, 44 in. Front bearing, 2½ x 9½ in. Horsepower required, 5 to 12. Floor space: base, 32 x 84 in.; maximum overall, 52 x 134 in. Weight; net, 4,500 lb.; with countershaft, 5,000 lb.; crated, 5,150 lb.; boxed for export, 5,600 lb. Export box, 75 cu.ft.

spindle is of white metal and the rear one is a combined radial and thrust ball bearing. The upper bed can be slid along the lower one and locked in any position, adjustment being made by means of a screw operated by the handwheel at the right. With the gap closed, work 27 in. in diameter can be swung, while with the bed extended, a 60-in. swing is provided.

The tailstock is adjustably mounted on the upper bed. A tailstock operated by a hand lever or a treadle can be furnished, instead of the screw-spindle type shown. The upper bed supports also the slide rest, while one end of the auxiliary bed supports the spinning rest. The auxiliary bed is L-shaped and is supported not only by the bed of the lathe but also by a leg resting on the floor. The T-rest is adjustably mounted and provided with holes for the insertion of the spinning pins.

The compound slide rest can be swiveled or set to any position, providing hand feed for the tool in two directions. The longitudinal feed is 16 in. and the cross feed 9 in., a ¾ x 1¼-in. tool being used.

The machine is equipped with 20-in. and 12-in. faceplates. A countershaft and a belt shifter can be supplied. Chucks can be furnished for turning and spinning oval or elliptical work. "Compound-lever spinning tools" are especially adapted for use on the machine when spinning heavy sheets.

Oakley No. 3 Universal Toolroom Grinding Machine

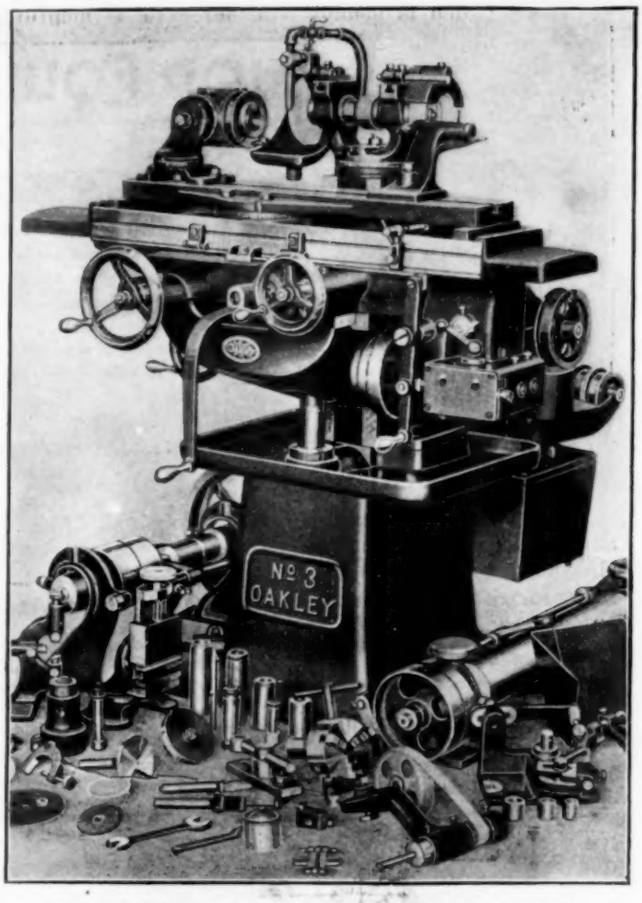
The Oakley Machine Tool Co., Cincinnati, Ohio, has brought out the No. 3 grinding machine shown in the illustration. Features are the mounting of the cone pulleys on the machine and the rack and pinion table drive. The cone pulleys are driven from the countershaft and the belt tension is maintained by an automatic belt tightener. The table drive is operated through bevel gears which are driven by a shaft from the feedbox bolted to the end of the saddle. The table driving mechanism is placed opposite the center of the grinding wheel head with the object of balancing the thrust.

The table movement is controlled by friction and may be either power or hand operated. Fast hand movement is obtained by using the large crank handle and may be controlled from either the front or rear of machine. Slow feed is obtained by using the handwheel on the front of the saddle. Table stop dogs are hinged. Three rates of power movement are available, obtained through the step-cone pulleys. The crossfeed is operated by handwheel from either front or rear of machine. The vertical feed is operated by handwheel, the thrust being taken up by a ball-bearing. Micrometer dials are provided for crossfeed and vertical-feed. The knee is of box construction to keep dust from bearings and working parts. It is dovetailed to the column, has adjustable taper gibs and is supported by a vertical screw.

The slide is aligned to the saddle by V and flat bearings which are protected by dust guards at both ends. It is oiled through a single oil cup. The taper adjustment of the slide is governed by a fine thread thumbscrew at the front of the table. The slide swivel is graduated in both degrees and inches per foot.

As shown in the illustration the workhead swivels horizontally or vertically. Adjustment of the head to take up wear may be made. T-slots are provided on the top and bottom for attaching tooth rests.

The wheelhead swivels either side of the center and has a graduated dial. The spindle runs in bronze adjustable taper bearings. A flange which is an integral part of the spindle serves as a thrust collar.



OAKLEY NO. 3 UNIVERSAL TOOLROOM GRINDING MACHINE

Specifications: Table surface, 5¼ x 33½ in. Taper adjustment, 2 in. per foot. Distance, center of spindle to table, minimum, 0 in.; maximum, 10½ in. Longitudinal movement, 17 in. Vertical movement, 10½ in. Cross movement, 9 in. Maximum distance between centers, 20 in. Workhead taper hole, No. 12 B & S. Swing over table, 10 in. Wheel speeds, 3,683 and 5,950 r.p.m. Countershaft pulleys, 6 in. in diameter, 2½ in. belt, 850 r.p.m. Floor space, 68 x 53 in.

The universal tooth rest has both flexible and rigid blade supports. Among the attachments is an extension spindle support to be used when grinding wide surfaces. A countershaft-driven, fan-type pump for circulating coolant is mounted on the tank at the rear of the machine.

Armstrong Spring Threading Tool

The Armstrong Brothers Tool Co., 317-57 N. Francisco Ave., Chicago, Ill., has recently placed on the market the spring threading tool shown in the illustration. It is claimed that the tool combines strength and convenience of adjustment and operation with the

ARMSTRONG SPRING THREADING TOOL

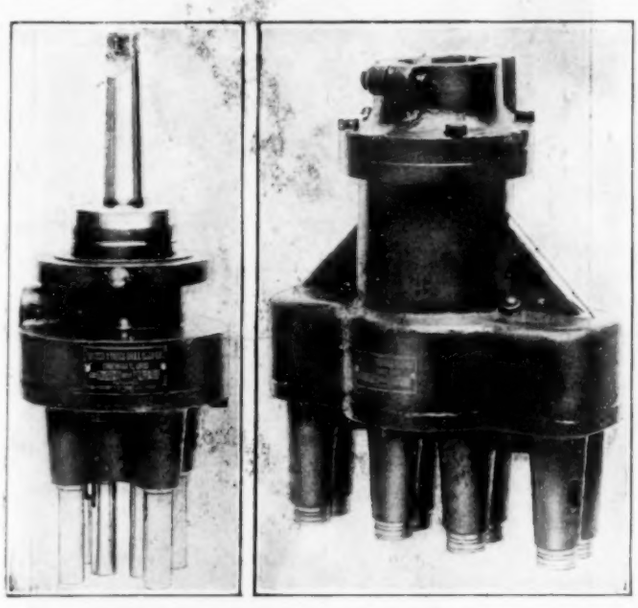
resiliency which is usually considered to be helpful in obtaining a smooth thread or finishing cut, especially on alloy steels of a tough nature. Means are provided for quickly obtaining rigidity, so that the tool can be used for roughing or ordinary turning. The cutting tool can be swung to either side of its center position.

Tools holding stock $\frac{5}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, or $\frac{3}{8}$ in. square can be furnished. The holder sizes range from $\frac{3}{8}$ x $\frac{7}{8}$ x $5\frac{1}{2}$ in. to $\frac{3}{4}$ x $1\frac{5}{8}$ x $8\frac{1}{2}$ in., and the weights from $\frac{1}{2}$ to $3\frac{1}{4}$ lb.

Fixed-Center Multiple-Spindle Drill Heads

The United States Drill Head Co., Cincinnati, Ohio, is building a line of fixed-center, multiple-spindle drill heads, each head being especially designed for the piece of work upon which it is to be used. The main spindle is fitted with a bronze bearing, and both the main spindle and the drill spindle are provided with ball thrust bearings. All gears, spindles and studs are hardened steel, the gears running in grease.

There are two methods of attaching the heads to the drilling machine. The lighter heads are usually driven



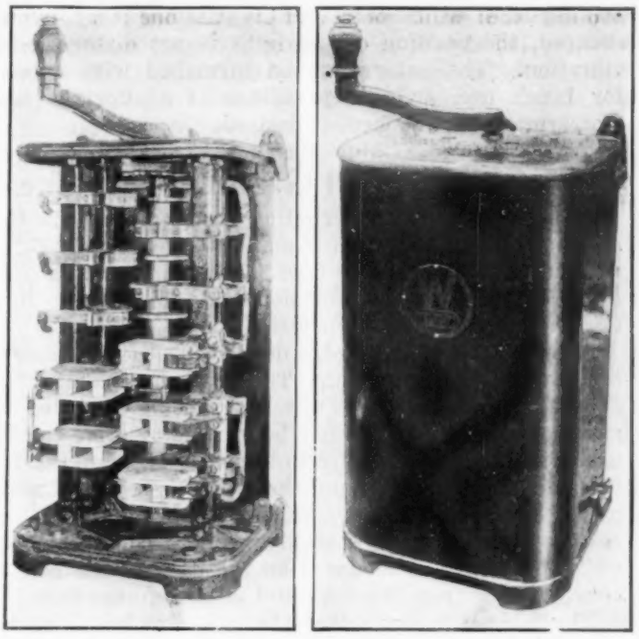
"U. S." FIXED-CENTER MULTIPLE-SPINDLE DRILL HEADS OF LIGHT AND HEAVY TYPES

by a standard taper shank, as shown at the left in the illustration. Heavy heads are driven by the method shown at the right, the head clamping to the quill and being driven by a key inserted in the drift slot of the spindle. The first method requires the use of a bar to prevent the head from turning with the spindles.

Westinghouse Type "S" Contactor Controller

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has recently brought out the drum contactor controller shown in the illustration herewith.

This controller is intended for starting and regulating the speed of shunt-series, and compound-wound d.c. motors. In operation it adjusts the resistance in series and parallel with the motor armature, and employs the same principal as the magnetic contactor type controller, except that the contactors are operated by cams mounted on the controller shaft. The contactors open and close

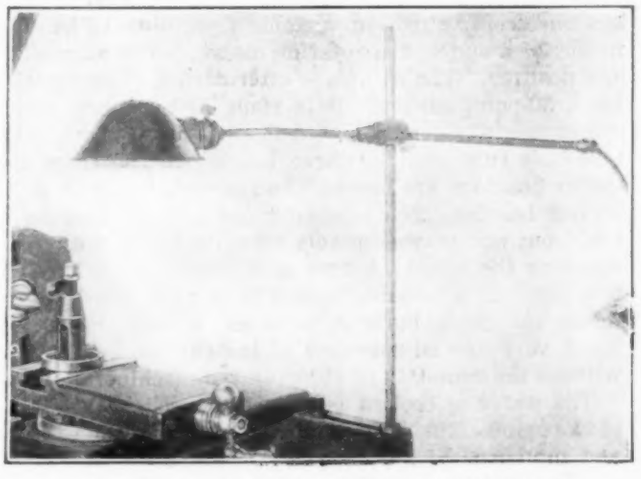


WESTINGHOUSE TYPE "S" CONTACTOR CONTROLLER, OPEN AND CLOSED

with a quick, positive action which reduces arcing. All arcing is limited to the contact tips by the rolling motion of the contacts, consequently there is no pitting or burning of that part of the contact where the load current is carried. The line contactors are protected by magnetic blow-outs. The controller will operate in any position as the contactors are spring actuated and their operation is not affected by gravity. This type of controller can be supplied either with or without dynamic braking and is applicable for use with motors on cranes, hoists, crushers, bridges, roll and transfer tables and practically all places employing this system of control.

"Anyangl" Lighting Fixture

The Miller Saw-Trimmer Co., Pittsburgh, Pa., has placed on the market the "Anyangl" lighting fixture shown in the illustration. The device is intended especially for attachment to machine, so that light may be concentrated upon the work. The lamp is provided with a reflector and a cage for preventing breakage. It can be swung in a complete circle either horizontally or vertically or adjusted for height, it being necessary



MILLER "ANYANGL" LIGHTING FIXTURE

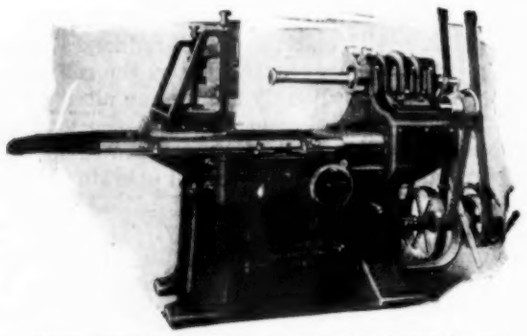
to loosen only one thumbscrew for the purpose of making the adjustment. It is claimed that, when clamped, the position of the light is not disturbed by vibration. The fixture can be furnished with a base for bench use, and different lengths of upright and crossarm can be supplied, if desired.

"Micro" Internal Grinding Machine

The "Micro" internal grinding machine shown in the accompanying illustration is manufactured by the B. L. Schmidt Co., Davenport, Iowa. The principal features of the machine are the provision made for wet grinding and the semi-automatic operation.

A heavy base is provided, a door in front giving access to the water tank and pump. The drive shaft is mounted at one end of the base, a support being provided to steady its outer end. Either belt or motor drive can be used, and an overhead countershaft is unnecessary. One of the ways is flat and the other V-shaped. Lubrication of the flat way is accomplished by means of felt pads, while the V-way has fiber rollers running in oil wells. A trough is mounted on the back of the bed to convey water from the table to the tank in the base.

The table is power driven through a rack and its reversal is automatic, although it may be operated by



"MICRO" INTERNAL GRINDING MACHINE

Specifications: Capacity; grinds holes 2½ to 10 in. in diameter up to 13 in. long (longer spindles furnished, if desired). Wheels: diameter, 2½ to 6 in.; face, ¾ in.; hole, 1¼ in. Wheel-spindle speeds, 5,500 and 3,652 r.p.m. Main bearing, 7 x 16 in. Planetary speeds, 48 and 25 r.p.m. Table: to center of spindle, 13 in.; size, 19 x 48 in.; speeds, 11, 6½, 5½, 4½, 3½ and 2½ in. per minute. Cross-slide: travel, 14 in.; adjustable to 34 in. Speed of drive shaft, 265 r.p.m. Floor space: over all, 110 x 42 in.; base, 54 x 26 in. Height, 39 in. Weight, 4,000 lb.

hand. Water grooves are provided and extension plates at each end protect the ways.

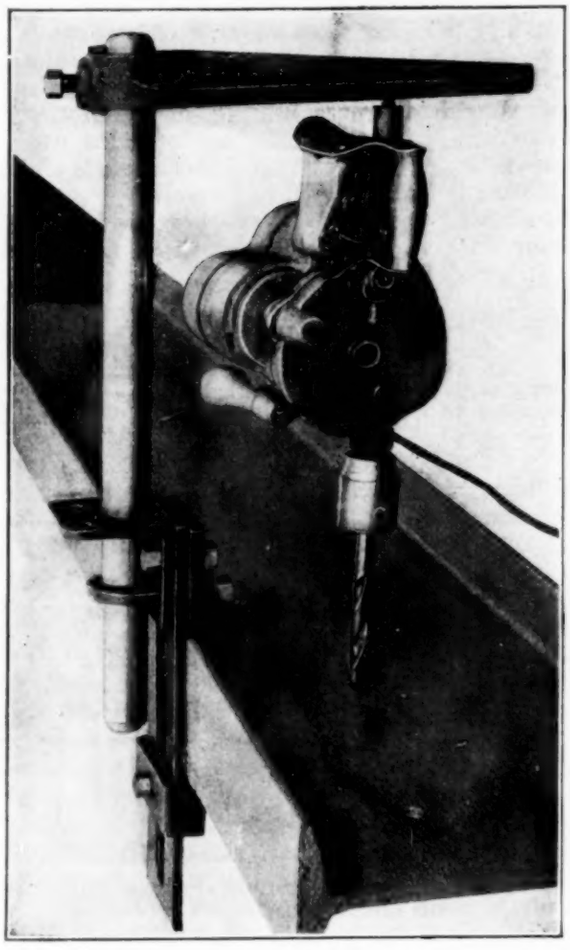
The headstock is mounted on the bed, the table traveling under it. The rotating sleeve, or main bearing, in the headstock is made of seasoned cast iron. The spindle has an eccentric motion variable from 0 to 1¼ in. By means of a clutch, the rotating sleeve can be stopped in any position. The spindle is of hardened chrome-nickel steel, 30-point carbon. It is made in two parts which are connected by means of a flexible water-tight joint, and it is supported by three bearings. The front and center bearings are bronze, the rear one being an S. K. F. ball bearing. The adjusting nut and the bearing at the front end of the spindle serve to prevent oil from reaching the wheel. A type of automatic wheel feed is provided. It is possible to feed in units of 0.0001 in. by means of push buttons provided on the headstock. Thus, very fine adjustments of the cut can be obtained without the necessity of stopping the machine.

The water or coolant is delivered through the center of the spindle, the water connection being made of brass and supported by ball bearings mounted on the rear of the spindle. The pump is operated through gears controlled by a lever mounted on the base of the machine.

The work is mounted on a cross-slide, the fixture shown being intended for holding cylinder blocks. The vertical adjustment is made by means of the screws at the top. In addition to the cross-feed, the fixture can be swivelled. Fixtures to suit special jobs can be furnished.

Canton Drill Clamp

The Poyser-Bucher Co., Canton, Ohio, has placed on the market the Canton drill clamp and support illustrated. This clamp was designed for use in conjunction



CANTON DRILL CLAMP

with portable drilling machines for drilling the flanges and webs of I-beams, etc. The method of attaching the device is shown in the illustration.

J. M. Jameson Speaks Before Philadelphia Foundrymen's Association

The 300th meeting of the Philadelphia Foundrymen's Association was held on Oct. 13 at the Manufacturers Club, Philadelphia.

Joseph M. Jameson, vice-president of Girard College, gave a talk on "Education for Industry." Some of the points he conveyed were as follows: (1) Preliminary education in the school of Girard College; (2) the training of apprentices; (3) part-time education between the school and industry; (4) continued education for those who are employed, such as night-school, etc.

The Olympia Machine-Tool Exhibition and Results

[This and the following two articles are reprinted from the European edition of the *American Machinist* and will serve to show how our English cousins regard coming machine-tool competition.]

The Machine Tool and Engineering Exhibition which closes on the date of publication of this issue must be pronounced a very distinct success as a display of engineering tools and products. Some of the technical lessons to be learned by the visitor have been indicated in these columns during the past few weeks.

Whether the success of the show in a commercial sense has been as great is a matter which is still uncertain; in any case it cannot be decided for some little time. Seed has been sown and the future will determine what develops. Undoubtedly some of the firms have met with success as measured in the most direct manner by orders received. Others have extended their circle of friends and acquaintances, the exhibition affording means by which they and their products became better known to potential clients. But it must be confessed that, unless the last few days have shown a very distinct change, a considerable number of exhibitors who judge by orders negotiated will have to regard their success as distinctly qualified.

An exhibition, even if of such a satisfactory character as that of the Olympia display, cannot really stand against a definite trade decline, with all the uncertainties of labor troubles, etc., and this is clearly shown in Germany, as explained on this page, based on information from a correspondent.

At Olympia many of the firms who have expressed themselves satisfied are relatively small or such as may be regarded as newcomers compared with firms whose names among engineers are household words. To these the merchant on the one hand and the small private buyer on the other have proved good friends, and it is possibly among exhibitors of this class that the chief successes have been gained.

The Failure of the Leipzig Technical Fair

It is openly acknowledged in Germany that from a business viewpoint the Leipzig fair was a complete failure. It cannot be said that this result was wholly unexpected, for it was clearly realized in industrial circles that in view of the business stagnation still obtaining in Germany no great volume of business would be done, but the utter absence of any buying activity worth mentioning left exhibitors almost dumfounded. There were approximately 3,440 exhibitors at the fair, which was attended by 34,000 visitors.

The various industries were well represented in separate sections in order to facilitate survey, and the machine-tool section, represented by the association of German machine-tool makers, was—as usually—the focus of the exhibition. We are assured by a correspondent that both as regards quality of material and workmanship the exhibits showed distinct signs of improvement and return to pre-war standards. Substitute material has materially decreased in use, being employed only wherever a saving could be effected without impairing the strength, quality or appearance of the part concerned. Thus the outward appearance of the fair was as brilliant as could be. Sales, however, were lagging to an unexpected extent.

Beyond this, it would appear that the detaching of the technical fair from the general sample fair—hailed with great satisfaction at its inauguration at the last spring fair has turned out anything but a success and has given rise to rather pronounced criticism and even hostility on the part of the exhibiting firms toward the management. Negotiations toward reuniting the two fairs are proceeding, and it is generally held that this will have been the last of the technical fairs held separately.

Various reasons are being advanced in explanation of the failure. The salient facts are the high prices and the overstocking of the machine-tool producing countries, not forgetting the improvement in the German exchange which, though latterly again downward, rendered buying in the German market half a year ago much more profitable.

American Machine Tools at Olympia: What Is the Lesson?

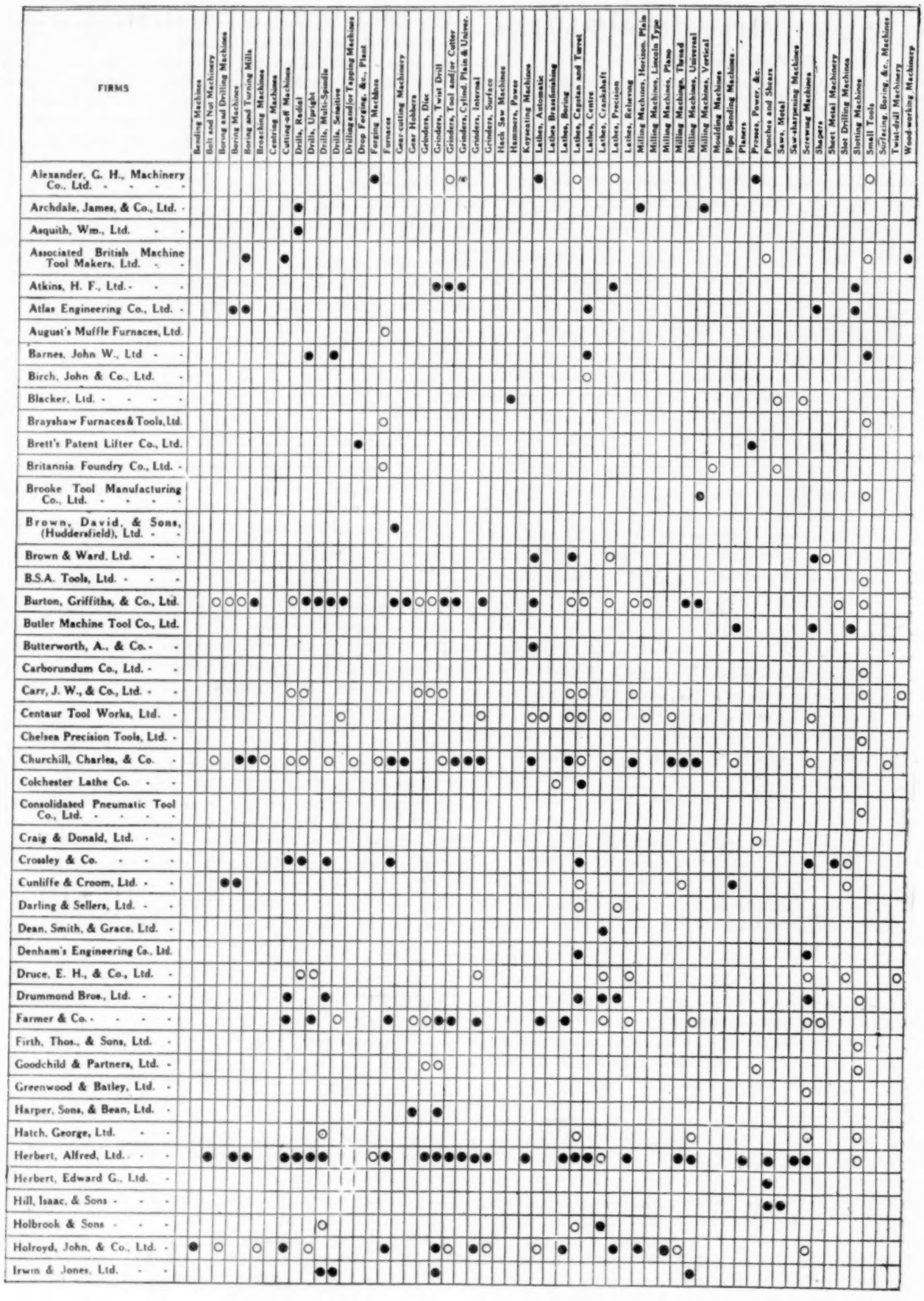
By S. Haughton.

What can the British machine-tool maker learn from the "Olympian" display? To this question we shall attempt an answer.

The exhibits are preponderantly British. The commendatory remarks of American visitors on our work have been pleasing to British ears; for the chief competitor's praise is praise indeed. That our machine-tool makers have made great strides and are still advancing is the general concession. The only doubt that remains is as to whether we have completely made up the leeway and got a little ahead, or whether the advance on both sides has been proportionate, leaving us still behind. These are the diverse asseverations, perhaps beliefs, of different people, all justifiable, no doubt, from particular viewpoints. Well, after a presentation of the whole of the evidence and an impartial summing-up, the verdict would probably be pleasing to all parties. It would, we are convinced, indicate a general improvement in which our share is unexpectedly but not overwhelmingly large; that neither side is so nearly perfect that one cannot learn from the other; that though ways differ they may lead equally directly to the same end; that, after all, seeming superiorities or inferiorities may be but differences due to dissimilar but not necessarily better or worse methods, organizations or equipment, and to dissimilar demands.

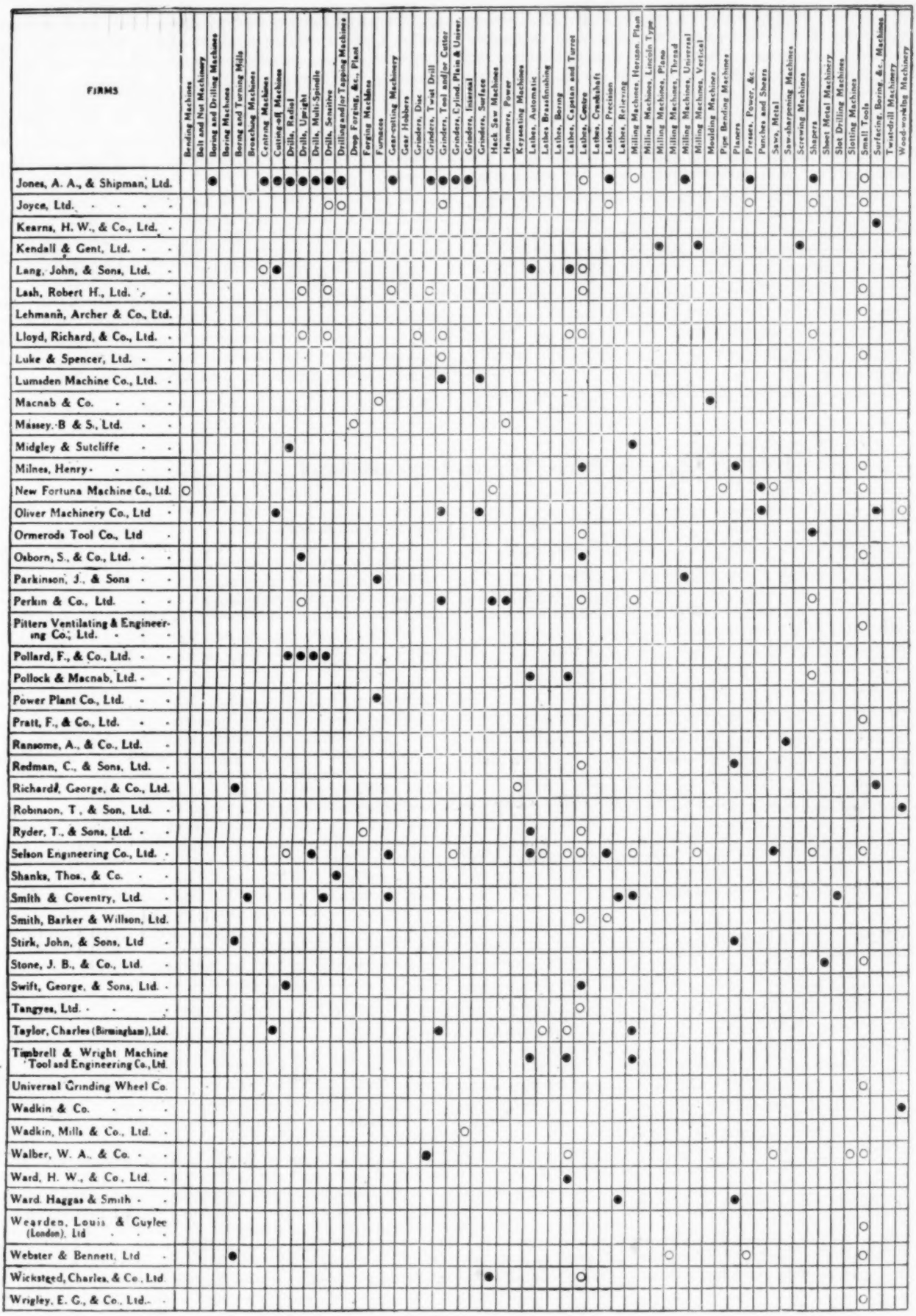
What can we learn from the display of America? Much. But when one begins to particularize selecting for study those types of machines for which America has become justly famous, the question always rises whether the lessons when learned will be of more than academic value, at least until the time has come when our conditions more nearly approach those of that country. For we still lag in mass manufacture, the very *raison d' être* for many of the lines in which America excels and probably the fount from which flowed its excellence.

Consider automatics, the name by which, unqualified, we know those machines of lathe type adapted for the production of comparatively small pieces from the bar, from castings or from forgings. Here America undoubtedly led, if not in invention at least in development, to that high degree of perfection one associates with and really finds in the Brown & Sharpe, the Cleveland, the Acme, the Bridley, the Potter & Johnson and other machines. Home (American) demands alone



MACHINE TOOL AND ENGINEERING EXHIBITION

GRAPHIC GUIDE TO THE EXHIBITS: This chart will enable the works manager or engineer who wishes to study the va- can see at a glance which of the firms demonstrated a particular tool by running it and not merely making a display of stationary



AT OLYMPIA, W., ENGLAND, SEPT. 4 TO 25

rious examples of a given line of tools or appliances to pick out the firms that displayed these particular tools, etc. Moreover, he machines. The open circles represent stationary tools, and the black circles running tools.

were probably large enough to insure that incentive, in competition, to the continual study essential to quality and quantity progress. Only by the greatest effort and the best of good fortune, in invention say, can we hope to make up the leeway. Obviously, from American automatics we have much to learn, and when we have learned, the embodying of our knowledge in practical machines can easily lead to failure, for there is the danger that by the time our machines are on the market our friends on the other side will have brought down the things they had up their sleeve ready to meet the anticipated competition of the newcomer. It is a startling fact that only to one British machine-tool concern can we attach any reputation worth the name as manufacturers of really high-grade automatics, and then only as makers of the larger chucking automatics. A few there are, however, who are making a bid by machines possessing new and claimed-to-be improved features.

Still there is hope for the British machine-tool maker, for users of automatics well know that most machines suffer from disabilities that appear inseparable from their present construction— cams and their shafts yield, chucking devices fail. There is certainly scope for radical improvements. From known weaknesses the designer can learn that room exists for invention, that invention must strike at the very roots of most current designs if success in competition with them is to be achieved.

All that has been said respecting automatics will apply with little modification to modern grinding machines. The numerous American specialists in the higher-grade machines have but one British specialist to fear, and, if one can judge from the extraordinarily rapid expansion of this firm, the competition must have been felt severely. The presence at Olympia of an American machine possessing many new and attractive features before that machine had been offered at home suggests a recognition of this competition and a will to counteract it.

The Broader Field for Engineering

Engineering in some form or other enters into or affects every business and every life. It is a profession which by its nature has to do with improving the public welfare. "The time has arrived in our national development when we must have a definite national program in the development of our great engineering problems," says one of our foremost engineers.

SOME of the reasons for forming the organization of engineering societies known as the Federated American Engineering Societies are given in the following excerpt from the address of Arthur P. Davis, president of the A. S. C. E., at the annual convention of the society in Portland, Oregon.

The demand for active participation of all engineers in civic and other work for the general benefit of mankind and the advancement of the engineering profession has been growing for many years and is greater today than ever before. Various plans for accomplishing this purpose are suggested and the pressure has been such that the American Society of Civil Engineers and the other founder societies have each taken a more or less active part in such work.

Recognizing the necessity of combining efforts in this line and also the desirability of somewhat separating such activities from the technical functions of these societies Engineering Council was formed with the idea that it would represent the four founder societies and gradually add to this number through powers conferred upon it for that purpose. It has in the three years of its existence added the American Society for Testing Materials and the American Railway Engineering Association but is still far from embracing all of the engineering societies of the country. It has some fundamental weaknesses. It lacks in representative character and democracy and is without power to raise funds, but must depend upon voluntary contributions from its constituent societies and others. Experience has shown that these deficiencies can be best remedied by substituting a league or federation designed to include all of the engineering societies, national, state, regional and local.

A constitution to this effect was adopted at the convention in Washington in June. The federation does not provide for any individual members but is merely an instrument for combining the efforts of existing societies by forming them into a federation with definite powers and provided with sufficient funds to accomplish its purpose.

Measures of great importance to the world, to our country and to our profession demand immediate and vigorous attention and it is imperative that they have behind them the unified efforts of all the organized engineers of the country and all the prestige that the greatest, the oldest and the most eminent societies can offer.

Among these measures are the unification of the engineering work of the government under one department with a technical head. This will promote efficiency and eliminate waste; and what is more important, will serve as a precedent for the reorganization of other departments along similar lines of homogeneity, efficiency and economy.

The spirit of progressive movement is summarized in the terms "service through co-operation." It means service to mankind, to our country, to our profession and to ourselves. It cannot reach its fullest expression without the active co-operation and influence of every engineering organization in the country.

We cannot act effectively unless united and by calmly reasoning together on pressing questions, guided by the pole star of righteousness, we can unite upon fundamental principles and make our influence for good a power in the land and only thus can we perform the duty we owe to ourselves to our fellowmen and to posterity.

Excerpts from Hoover's Address

Herbert Hoover, president of the American Institute of Mining and Metallurgical Engineers, in his address to the society at Minneapolis, described the field of the engineer in the broader sense. The following excerpt tells what are our great engineering problems and deals with their development.

The time has arrived in our national development when we must have a definite national program in the development of our great engineering problems. Our rail and water transport, our water supplies for irrigation, the provision of future fuel resources, the development and distribution of electrical power, all cry out for some broad-visioned national guidance. We must create a national engineering sense of provision for the nation as a whole. If we are to develop this national sense of engineering and its relations to our great human problems it must receive the advocacy of such institutions as this.

We, together with our sister engineering societies, repre-

sent the engineers of the United States. It is our duty as citizens to give voice to those critical matters of national policy which our daily contact with this, the fundamentally constructive profession, illuminates to us. Just as medical associations voice the necessity of safeguards to national health; as the bar associations safeguard our judiciary, so the engineers should exert themselves in our national engineering policies. We have none, but we need some, or the next generation will face a lower instead of a higher standard of living than ours.

Must Co-ordinate Development

The development of our transportation, fuel, power and water under private initiative has been one of the stimuli that have created the greatness of our people. It has been easy to compass when the problems were more local and filled with speculative profits. There however arises a time when this haphazard development must be co-ordinated in order to secure its best results to the nation as a whole. This system has given us a 50 per cent result; if we are to have 100 per cent we must have a national conception and national guidance. This last 50 per cent involves problems beyond individual initiative alone.

Not only is individual initiative insufficient because the problems involve political, financial, interstate matters beyond corporate ability, but we have, with practically unanimous consent of the country, adopted a policy of the limitation of profits in the operation of public transportation and power and some other utilities, and through the pressure of public opinion we are rapidly coming to a limitation of profit in the development of other large sections of national resources which tend to become natural monopolies. While the limitations of these profits makes for public good, on the other hand they also militate against individualistic development of national resources and necessitate the co-operation of the community as a whole to secure initiative for wider development in the national sense.

Conservation Is National Concern

Certain of our national resources have always been in national ownership, such as waterways. Certain others, such as reclamation, irrigation, distribution of water for power, are rapidly coming under Government control. In others, such as timber, coal, and oil, the possible exhaustion brings their conservation or provision for the nation's future into national concern. In our railway problem national action has until recently been directed wholly to limitation of profits. Latterly it has undertaken to regulate wages and give some small recognition to the necessity of equipment. But microscopic attention has been given to the greater problem of how to get more transportation, to get it so organized as to secure real economic operation in its broad sense.

Mountain Water Storage Problems

Of other problems akin to this, we are confronted throughout the West with the fact that a large portion of our average low water supply is already under engagement for irrigation and power. The time has come when that expansion of the land available for cultivation, or into more intensive cultivation, is a factor of mountain storage of water to increase our stream flows in the low season. We have thus a storage problem on a scale we have not hitherto dreamed of, and, again, it is a problem involving co-operation in financial and economic distribution and navigation—interstate questions, in which individual initiative must have the assistance of the community.

Another series of such problems lies in our oil supplies. If we are to have a mercantile marine and to maintain our navy on a basis of equivalent efficiency with foreign navies, if we are to maintain the development of the gas engine—the greatest lift in our standard of living and saving of labor in fifty years—we are confronted with the necessity of securing additional oil supplies from outside our own boundaries. Our own supplies, so far as now known, do not represent twenty-five years at our present rate of consumption. The Institute many months ago was the first to give warning to the Federal Government of the gradual absorption of all of the oil sources of the world by other great powers and that within a short time we should be dependent upon the good will of those powers for our necessary oil supplies. No private individual can compete with foreign governments in the measures that they are adopting to hog the resources of the world. This problem again is an engineering problem that requires more than private initiative.

Transportation

A problem of even more pressing importance than these is the whole question of transportation. Our inability to move the commodities which we create is stifling production. It is increasing the cost of distribution and has placed a tax on the American people in decreased production and increased cost of distribution greater than all the taxes imposed by the war.

Congressional Waste

We have been dabbling in the improvement of water transportation of the United States for 100 years, and so far as I know never yet have we considered it as a problem requiring complete co-ordination of the entire transport problem for the whole country.

One result of the policy pursued has been that our waterways have been so badly handled that they have not been able even to compete with the railways, and today, with an enormous increase in railway rates, we find ourselves utterly unable to handle the great bulk commodities of the country at the possible lower charge over our waterways. The opening of the St. Lawrence to ocean-going vessels means 5 cents a bushel to every farmer in ten states. Likewise of no less importance to the people of the entire country are our internal waterways.

These projects have a simple result in the engineer's mind; they make greater production possible with less human effort; they increase the standard of life; they provide for our children. All these problems are much akin, and the time has come when they need some illumination, guidance, and co-operation in their solution from the Federal Government. Nor do I mean a vast extension of Federal bureaucracy in Federal ownership. If in the first instance through an agency of the central government, we could have an adequate study and preparation of plan and method made of these problems of engineering development over the next fifty years, viewed solely in their national aspects, we would have taken the first step toward the adequate provision of an increasing standard of living and a lower cost of living for our descendants.

Government of Co-operation

The second step is to determine that our government will be a government of co-operation limiting profits surely, but holding to individual initiative as the single hope of human development. In order that we shall have some central point in the Federal Government where these problems may be adequately considered, from which they can be ventilated for the verdict opinion, where the business brain of the country can be called into conference and co-operation with the government, and therefore with the people, the engineers of the United States have proposed time and again that a cabinet department should be established in Washington, either new or to replace the Interior Department, to which should be assigned the whole question of public works.

You are familiar enough with the advantages of such a department from an everyday administration point of view, and enormous saving to the government from the duplication or competition of the six or seven departments now engaged in engineering construction work of this character, but on this occasion I wish to call your attention to the fact that such a department has become an essential from the point of view of proper consideration and presentation to the American people of these broader national engineering problems, upon which the next generation must depend if our country is to march forward.

SPARKS FROM THE WOR

Valentine Francis

Annual Meeting of the American Foundrymen's Association

Convention Most Successful Thus Far Held—Ohio State Fair Association Buildings Used for the 236 Exhibits—Some of the Papers Read—W. R. Bean Selected as President for Coming Year

The success that has attended the annual meetings of the American Foundrymen's Association in the past was even more marked in connection with the convention held this year in Columbus, Ohio, from Oct. 4 to 8 inclusive. As has been customary, the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers held its meeting in connection with the Foundrymen's meeting. It will be remembered that the Metals Division several years ago absorbed the old Brass Foundrymen's Association, so that its representatives were beyond doubt equally interested in foundry problems.

This year's exhibition was in extent and number of the exhibits actually the greatest staged for the entertainment and interest of the visiting foundrymen. Its size was made possible by its location in the many buildings of the Ohio State Fair Association and these with their wide acreage of floor space offered exceptional possibilities for both spreading the many exhibits to the best advantage and permittting many to participate who have not been able to obtain accommodations in the past.

Seven Buildings Used

Seven buildings were used for the 236 exhibits entered, which were grouped to some extent in classes. As an instance of the grouping it may be mentioned that all the machine-tool and kindred supply exhibits were grouped in one building and while the exhibits there shown by no means covered all classes of machine tools, there were enough to attract considerable interest.

The molding-machine exhibitors and foundry specialists had arranged a number of exhibits, many of them with operating equipment that proved highly instructive. The various manufacturers of welding and cutting equipment had likewise made arrangement by which they were in most cases able to show their devices actually in operation.

Some comment was noted to the effect that many of the old-timers were not in evidence at the convention and many familiar faces were no doubt missing from one cause or another. However, many probably failed to meet their friends due to the scattered nature of the hotel accommodations. All hotels were far too congested for comfort, over 4,000 being registered as members and visitors.

The technical meetings were in most cases held in the Amphitheatre under the direction of the officers who were responsible for the success of this year's program. These officers included: C. S. Koch, Ft. Pitt Steel Casting Co., McKeesport, Pa., president; W. R. Bean, Eastern Malleable Iron Co., Naugatuck, Conn., vice president; and C. E. Hoyt, secretary-treasurer.

There was a total of ten technical sessions so arranged that on only two occasions were two meetings under way simultaneously. The sessions included three devoted to general topics of interest to all foundrymen, two for steel topics, two for non-ferrous and one for malleable-iron subjects and two devoted to the discussion of topics in connection with industrial relations.

Sherwin on Castings

Among the speakers at the opening session was Leroy Sherwin of the Browne & Sharpe Manufacturing Co., Providence, who spoke on the topic, "Making High Grade Castings for Milling Machine Tables." Mr. Sherwin discussed the methods used in his own plant to produce such castings, on which he stated that the service requirements were very severe. A casting is desired which is close in grain, giving a hard, smooth-polished surface after machining and it must be free from either external or internal porosity. The patterns, the design of which play an important part in obtaining good castings, are arranged so that the mold will be entirely in the drag. It was found that the V-ways and oil ways were likely to be cut and washed when the molten metal ran over them when molded in green sand, so that now these portions are cast in dry sand cores. A careful selection is made of the molding sand and the molds are faced with a mixture of sand and sea-coal in which the proportion of sea-coal to sand is seven to one. Horn sprues are used for gating the castings so that the molten metal enters the mold from the bottom through two sprues at each end. Two risers are used located at equal distances from the center of the casting.

The cupola mixture is made up of 1,000 lb. of pig iron containing 300 lb. of eastern Pennsylvania low silicon, 400 lb. of northern and 300 lb. of southern pig iron, to which are added 250 lb. of steel scrap, 250 lb. of car wheels and 500 lb. of returned sprues and scrap. This mixture is calculated on the basis of a 2,000-lb. charge, but 3,000-lb. charges are actually used in the cupola and are made up accordingly. A close check is made daily on the analysis of the resultant castings. They are found to run approximately: Silicon: 1.300; sulphur, 0.115; phosphorus, 0.440; manganese, 0.550; combined carbon, 0.760; graphitic carbon, 2.540; total carbon, 3.300.

The charging of the cupola is done by hand. The steel scrap is placed on top of the coke, the pig iron close to the lining and the remainder of the scrap over them. All sprues and scrap

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Largest Welded Tank

What is perhaps the largest welded tank ever built was recently completed by the Welded Products Co. at Birmingham, Ala., for the Liquid Carbonic Co.

THE LARGEST WELDED TANK

The tank is 22 ft. in diameter and stands 30 ft. high. It was made of ¼-in. steel plate, joined at the seams by oxy-ecetylene welding. The big tank has satisfactorily withstood the required tests and has been found to be gas tight in all of the welded seams under excess-of-working pressures.

LD'S INDUSTRIAL FORGE
News Editor

used in the mixture are rattled before going to the cupola to reduce the amount of clay, sand and dirt carried into the charge. The cupola is tapped into a receiving mixing ladle which insures against the receipt of only a partial charge and variable mixture.

Moldenke on Zirconium in Cast Iron

Richard Moldenke spoke on the uses of the element zirconium in cast iron. He has conducted a number of experiments comparing the use of this element with vanadium, titanium and similar elements which have been used in the past as deoxidizers of cast iron. His conclusions were that while some beneficial effect could be obtained from its use in gray iron, at a strength of approximately 0.10 per cent, still the results obtained in cast iron did not compare favorably with similar results which could be obtained from its use in steel.

A plea for the standardization of the design and construction of patterns for steel castings was made by K. V. Wheeler, of the Lebanon Steel Foundries, Lebanon, Pa. He called attention to the large number of impractical patterns from the commercial standpoint which are submitted to the average steel foundry. He stated that a few foundries have taken steps to install a systematic inspection of all patterns received and then call the customers' attention to patterns which are suitable for intensive production and good castings. Among the points made was that some foundries ask for as much as ¼-in. finish allowance while others require only $\frac{1}{16}$ in. or in some cases ⅛ in. or even less finish. A standardization in this line would let the customer know better how to order his patterns to insure a good quality of finish when it came to machining. Another plea was for standardization of the pattern limits with respect to the length and breadth of average castings thus permitting better use of standard molding equipment.

Gale on Pulverized Coal

Those who have been interested in the subject concerning the substitution of pulverized coal to replace oil and gas in industrial furnaces will be interested in the experiences detailed by C. H. Gale, of the Pressed Steel Car Co., Pittsburgh. He spoke of experiences in a foundry where pulverized coal was substituted as a fuel for gas and oil in annealing furnaces. Certain changes in the physical characteristics

(*Continued on page 788j*)

Industrial Conditions in Spain

That Country Declared To Offer Greater Opportunities Than the Whole of South America—American Machinery Gaining in Popularity in Spite of Exchange Rates

Spain affords a good market for American machine tools, according to Henry S. Moos, director of the American Machinery Corporation (Sociedad Anonima Española) Madrid and the Sindicato de Maquinaria Americana, Bilbao. Just how good the Spanish market is may be judged from his statement that Spain offers opportunities greater than those of the whole of South America. Conditions pertaining in Spain are outlined in the following paragraphs, written as the result of an interview with Mr. Moos.

We are not accustomed to think of Spain as a manufacturing nation, probably because we think chiefly in terms of machine tools. The fact is that there is a great deal of manufacture of such things as cork, olive oil, clothing, sugar, paper and hardware, and more recently ships and machinery.

Eight to ten years ago, with buyers of machine tools, price was the only consideration. An 18 in. x 8 ft. lathe meant a lathe of 8 foot bed that would swing 18 in., without regard to strength, design, power or attachments. The lowest bidder got the order. The successful bidders as a rule were the Germans and the Swiss. There was not a great market because of the availability of imported manufactured goods and machines and therefore little incentive to make them. This situation when summed up means that there was before the war no machine-tool industry in Spain.

Machine Shops Started

As soon as the import supply was cut off by the war machine shops started and at the close of the war there were about a dozen real shops manufacturing such machines as lathes, drilling machines, milling machines, shapers, planers, punches, shears and stamping presses. These machines were being made to some extent on American machines, which had been bought at prices several times as great as those of the flimsy German and Swiss machines which they replaced, or which were in competition with them in the market.

With trade resumed more American machines than others are being sold. This is true in spite of the fact that the dollar is equal to 7 pesetas. The point of view of the manufacturer and the dealer has changed from one which asked "How much does it cost?" to one which asks "What will it do?" In other words, the trade is being built up on efficiency lines. The dealer who is the most successful is selling the manufacturer what he needs rather than what he thinks he wants. He is not in any way forcing sales because he has the right goods to sell and the right records of production and dollars saved on production with which to convince his customers of the truth of his statements. Let it be said here that if the dealer approaches his customer in the right manner, which means on a strictly business basis, he will find an attentive ear.

U. S. Machinery and Labor

The dealer is in a position to know methods and to know machines. It is then his business to educate his customers and to advise them. If a customer has it in mind to buy a cheap tool which will not bring results it is a part of the dealer's duty to educate him out of it; and it is just as much of a duty to prevent his buying one of the dealer's own good machines if he does not need it. It is in this way that

Five More Societies Join F. A. E. S.

The joint conference committee of the Federated American Engineering Societies announces five additional members, raising the total to nine members:

Engineering Association of Nashville. On June 7, 1920, this association voted to become a charter-member.

American Institute of Chemical Engineers. At its meeting of June 29, 1920, the institute voted to join.

Engineering Society of Buffalo. At the meeting of Sept. 21, 1920, the society voted, unanimously, that it become a charter-member.

American Institute of Mining and Metallurgical Engineers. At its meeting on Sept. 24, 1920, the board of direction voted to become a charter-member.

Society of Industrial Engineers. The board of directors of the society have voted to become a charter-member.

The other four members are the American Society of Mechanical Engineers, American Institute of Electrical Engineers, Technical Club of Dallas and the Cleveland Engineering Society.

American machines are being sold in Spain today.

A further aid to the sales of American machines, which incidentally are being recognized as real producers, is the fact that their accuracy allows a less skilled class of labor to operate them. Old German machines with which Spain was equipped lacked so much in quality that they required good machinists to turn out good work on them. Such a situation made the good machinists feel indispensable with the very natural result that there were many strikes. With the modern American machine operated by a comparatively unskilled laborer and the skilled machinists confined to the "set-up" or "adjuster" class, such trouble has been reduced to a great extent.

Five to seven years ago, a good machinist was making from $1 to $1.30 a day, whereas he now gets around $3 or possibly a little more. A shop superintendent will get about $140 a month.

Import Duty

The import duty on machinery is at present $4 per hundred kilos. There is a governmental tendency to increase this duty, but there is no certainty that it will be done, because it is believed that the sound argument that machinery is one of Spain's greatest present needs will be listened to. Spain is not ready to go on her own, in fact she is in a position where she will help herself most by buying American tools and letting them into the country without being subject to high duty.

So far as concerns general conditions in Spain they rather closely parallel those in the U. S. The actual prices in American money are lower, but comparatively they are about the same. Foodstuff, clothing, rents, real estate, automobiles and machine tools are high. The government is making an attempt to lower the cost of living by buying grain and cold storage food from Argentina and is sending government freighters to get them. In some of the larger cities apartment houses have been turned into offices which means that building has been very slow and has its effect on keeping rents up. Labor unions are strong and in some cases, at least, not wise. For example, they have ruled that none of their members may engage in piece work. The government is at present giving attention to prospective legislation concerning contracts between employers and workmen. Eight hours per day is the official working day for employees of private enterprises as well as government plants.

Railroads in Poor Condition

The railroads are in poor shape. The rates are so low in comparison to wage expenditure that equipment cannot be kept in first-class condition and expansion cannot be considered. It is believed that the government will take steps to relieve this situation, at the same time in all probability keeping rates on foodstuffs and like necessities low.

Spain is well along in water-power development. The smallest village is almost certain to have electric lights. Its mayor, though he may not be able to sign his name, will in all probability have electric light and an electric iron in his home. The greater part of the electric power required is generated by water power.

Spain, though an old country, offers a large field for development and for the sale of machinery and this field is increased by the Spanish zone of Morrocco which is rich in iron and silver and is reputed to contain oil. The trend is toward modern methods of manufacture and development, which means greater requirements for machinery and according to present signs, American machinery especially.

Annual Meeting of American Manufacturers' Export Association

Membership Opened to Banks and Steamship Companies—Important Discussions on Financing of Foreign Trade, Taxation and Latin-American Markets—W. C. Redfield Elected President

One of the most successful meetings in its history was held at the Waldorf-Astoria, New York City, on October 14 by the American Manufacturers' Export Association. At the business session in the morning an amendment to the constitution was adopted opening the membership circle to banks and steamship and shipping companies. It was felt that the addition of these bodies to the organization would increase its strength and improve the chances of favorable action when it appeared before government boards or committees to request legislation or rulings in the interest of American foreign trade.

William C. Redfield, former Secretary of Commerce, was elected president of the association for the ensuing year to succeed W. L. Saunders of the Ingersoll-Rand Co. The other officers elected were as follows:

Vice Presidents—H. S. Demarest, Greene, Tweed & Co., New York; F. H. Taylor, S. S. White Dental Manufacturing Co., Philadelphia; C. K. Anderson, American Wire Fabrics Co., Chicago; J. S. Lawrence, Lawrence & Co., Boston; H. A. Koster, Koster & Co., San Francisco; C. A. Green, American Pitch Pine Export Co., New Orleans.

Treasurer—William H. Ingersoll, Robert H. Ingersoll & Bro., New York.

Directors—James A. Farrell, United States Steel Corporation; E. M. Herr, Westinghouse Electric and Manufacturing Co.; A. C. Bedford, Standard Oil Co.; W. L. Saunders, Ingersoll, Rand Co.; C. B. Wynkoop, Cosgrove & Wynkoop Coal Co.; Lewis E. Pierson, Irving National Bank; William Pigott, Pacific Coast Steel Co.; H. J. Fuller, Fairbanks, Morse & Co.; John Bolinger, National Shawmut Bank; D. E. Delgado, Eastman Kodak Co.; W. W. Nichols, Allis Chalmers Manufacturing Co.; Dwight E. Austin, Nestle's Food Co.; W. C. Durant, General Motors Co.; C. E. Jennings, C. E. Jennings & Co.; Charles A. Schieren, Charles A. Schieren & Co.; F. A. Seiberling, Goodyear Tire & Rubber Co.; George Edward Smith, Royal Typewriter Co.; Walter C. Allen, Yale & Towne Manufacturing Co.

Secretary—A. W. Willmann, New York.

The afternoon session was devoted to papers and talks on various phases of foreign trade. Mr. Saunders in his opening address sounded the keynote of the meeting, "To obtain permanent world trade American manufacturers must now take a leading part themselves." Mr. Saunders showed charts prepared by the research department of the Federal Reserve Bank of New York indicating the proportion of our foreign trade passing through the port of New York for a period of thirty years, the relation between export values and actual tonnage volume and commodity prices, the variation of exports and imports over forty years from the forty year trend, and the relation between commodity prices and exchange rates. He pointed out that foreign trade is really very close to the line of normal trend at the present time and not so abnormally increased as reports seem to indicate. Also that the departure from a gold currency basis and credit inflation are the principal causes of high commodity prices and low exchange rates.

The next speaker was James S. Alexander, president of the National Bank of Commerce. He defended the attitude of bankers toward the financing of foreign trade and pointed out that the conditions of the past that had led to the feeling against the bankers had entirely changed and that the banks were doing their share. He went on to say with regard to foreign trade:

"Just what ratio between our foreign trade and our domestic trade may come to be established as normal it is impossible to say at present. But it can be said that a closer approximation to equilibrium between our export and import trade must be expected, whether that be brought about through a decrease of our exports, an increase in our imports, or both.

"If a marked recession in our export trade should prove to be one of the corrective factors tending to stabilize international trade, it is my belief that such a recession should be accepted as economically sound and that we should not incur the dangers of seeking to stimulate by artificial measures the volume of our foreign trade. Where there is a real demand for our goods there will be a real market. It is the business of the banks to finance goods for real markets. It is not their business to attempt to maintain expanded foreign trade when it becomes manifest that there is not the continued economic basis for that expansion.

"A comprehensive view of the foreign situation indicates that the real and basic need of Europe is for our raw products. She needs them to reestablish her own industries upon a fundamentally productive basis, increasing her export powers so as to liquidate her adverse balance of indebtedness. Her need is for raw products rather than for many classes of our manufactured products which during the war period she had to purchase from us but which, as her own industrial organization is rehabilitated, she can increasingly produce for herself without reliance upon us.

"Also in financing our foreign trade we must not lose sight of our business situation as a whole. We must not finance our foreign trade on a basis that will perpetuate over-expansion in our domestic banking credit. The great bulk of Europe's debts to us is in the form of long time credits or of commercial credits which it seems impossible to realize on at once. This is a serious element of non-liquidity in our credit structure. If it is necessary to readjust our domestic credit situation,

our foreign trade also must be subject to that necessity. The liquidity of our commercial credit structure should be a chief concern. Therefore it is one of the pre-eminent duties of the banks to encouarge a return as fast as possible to reciprocal foreign trade in equilibrium financed by liquid credits.

"The most desirable foreign trade is that with countries which give most promise of being able to reestablish their own productivity and to regain at the earliest moment the ability to liquidate their debts here with goods. It is also but the part of wisdom to favor, in our trade with those countries such products of ours as will serve most rapidly to help them return to a condition of economic stability.

"These are all practical considerations for business men as well as bankers. Banks make money by helping others make money. The way for business to make money is to make sure that the profits of today shall not be wiped out by the losses of tomorrow. The only way in which this can be assured is to see to it that the business structure which is built today is not built so weakly that it will collapse under the demands of tomorrow.

"Therefore, when bankers see that business conditions have reached a stage of expansion that requires readjustment they should fearlessly take what steps are necessary in the situation. Their action must be based on self-interest, on the demands of business and above all on the best interests of all concerned. This is my conception of true banking cooperation with business."

W. A. Harriman, president of the American Ship and Commerce Corporation, told of some of the difficulties confronting American shipping companies in their attempt to break into the shipping business in the near and far east. Great Britain has such a strangle hold on the business at present that his company has so far been unable to secure the cargoes wanted. He also pointed out our great deficiency in properly trained personnel to handle not only the ships but the business on shore at both ends. This was one reason for the making of the contract with the Hamburg-American line which has caused so much criticism and comment. Mr. Harriman urged the support of American steamship companies by the private investor and pointed out the handicap to private business caused by the government-owned Shipping Board fleet. He also mentioned the high cost of operation under the American flag.

Otto H. Kahn pointed out rather briefly the bad features of our present taxation system and went on to make the following constructive suggestions:

"The road of recovery from the appalling shock of the war, intensified in its after-effects through faulty treatment by the physicians, i.e., the statesmen in charge, is necessarily slow and hard. I think the more that road is thrown open now to the ordinary travel of human-kind and the more it is freed from bureaucratic impediment and from governmental interference, except for purposes of policing and traffic-regulating, the better it will be.

"The President, the heads of the Executive Departments, and Congress are vastly overworked. It is simply inconceivable that these instrumentalities of administration and legislation can give the necessary time and thoroughness of study to the variety of complex questions which call and will increasingly call for consideration and action.

"The burden which both the Senate and the House place upon their members in the investigating and gathering of facts and the hearing of witnesses, is exceedingly heavy. A very large portion of the time and energies of our legislators are absorbed in these functions. With the best intentions and the most conscientious application, it is not possible for Senators and Congressmen to do that kind of work to best advantage.

"Moreover, experience has proved that Congressional Committees cannot give to the task that continuous and concentrated attention which it requires.

"Much relief could be obtained by our legislators and very advantageous results accomplished if part of the burden of holding hearings, gathering views and investigating economic and other non-political subjects were placed upon the shoulders of others—non-office holding citizens acting in conjunction with Senators and Congressmen.

"The best ability and ripest experience of the country could be called upon and would surely be found ready to serve. It should come to be looked upon as a distinguished honor to be asked by Congress to act as one of its instrumentalities, and the resulting sense of responsibility and of public duty and trust should—and I have no doubt would—cause those selected and honored to give service wholly free from the bias of self-interest. Such committees might be composed of say five non-office holding members and six or seven Senators and Congressmen. A great part of the work could be done without necessitating the continuing attendance of the legislative members.

"The reports emanating from the deliberations of the Committee would, it may be hoped, come to be regarded as sources of reliable information to the public on social and economic subjects and if the Committees are wisely selected and rightly conceive their functions, their conclusions would surely come to have the public's confidence for impartiality and competency, irrespective of party affiliations.

"They ought also to make it easier for the political parties to have the courage of facing squarely and dealing without too much zig-zagging and compromising, with questions of a non-political nature, because the parties could point to the backing of the reasoned judgment of particularly expert and trustworthy men without political axes to grind.

"An incidental advantage of considerable value would be thus to bring together representative men of different callings and from different sections of the country in conference and exchange of views with each other and with Senators and Congressmen.

"It is part of my suggestion that such commissions should be selected and appointed not by the Executive, but by Congress acting through the President of the Senate and the Speaker of the House, or in some other suitable way. Experience has shown that the findings of commissions appointed by the Executive, whether Federal or State, have rarely been of great influence with the legislatures and are apt to meet on the part of their members with a certain degree of prejudice or even antagonism. I should be hopeful that commissions designated and directed by Congress and containing a proportion of Senators and Congressmen, would prove more effective and that their views and recommendations would receive a more propitious reception. The decision and responsibility as to legislation would, of course, rest no less than now with the Congress and the President."

Dr. R. S. MacElwee, Director of the United States Bureau of Foreign and Domestic Commerce, spoke of the good work of our commercial attachés. He mentioned the plans for the appointment of ten additional attachés and told of the work being done at the district offices in this country.

Machinery Club of Chicago Holds Fifth Annual Picnic

The fifth annual picnic of the Machinery Club of Chicago was held at Thatcher's Grove on the Des Plaines River, Saturday, Sept. 25. The baseball game was won by Ray Jones' team of supply men which defeated Peterson's team of machinery men by the fairly close score of 19 to 10. A great time was had by everybody, the event proving to be a real "get-together."

The pictures show: (1) Robert Cutlibertson, president, and H. E. White, in rear; (2) C. J. Banbach; (3) Fred Hermann and Clyde Blakeslee; (4) A. W. Smith, Chicago manager of L. S. Starret Co.; (5) Mr. Colby of Marshall-Huschart Co.; (6) F. L. Peterson, the man facing the camera, and (7) R. A. Millholland, smiling while packing in the "eats."

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of the metal annealed was noted. It was found that the tensile strength of the steel was greater with the pulverized coal fuel and that the elongation and reduction in area were less than had formerly been obtained from materially the same analysis and annealing temperature. Analysis of the steel treated showed that the carbon and sulphur content were considerably increased when using the pulverized coal fuel. The average analysis for a number of samples showed carbon before annealing 0.262 per cent and after annealing, 0.287 per cent; the sulphur before annealing, 0.041 per cent, and after annealing, 0.052 per cent. The coal used ranged high in sulpuur, showing from 2.45 to 2.80 per cent. It was thought that the fuel possibly had a case-hardening effect upon the steel and that such was the case was verified by analyses of test drillings. Both carbon and sulphur were found in much higher percentage near the surface than deeper in the section.

Entertainment had been provided for the visiting foundrymen, including a banquet at the Hotel Deshler on Wednesday evening. At the banquet one of the speakers, John A. Penton, of Cleveland, publisher of *Foundry*, announced the establishment of a fund of $20,000, the proceeds of which would be used as prizes for research work in the metallurgical industry.

A smoker was held the following evening at the Elks Club, at which prizes were given for those who had most successfully estimated on the number of foundry problems presented. At this gathering the officers elected for the coming year were announced as follows: President, W. R. Bean, Eastern Malleable Iron Co., Naugatuck, Conn.; vice president, C. R. Messinger, Sivyer Steel Casting Co., Milwaukee, Wis.; and secretary-treasurer, C. E. Hoyt, 712 Marquette Bldg., Chicago. The date and location of the next convention have not been announced.

Next Foreign Trade Convention at Cleveland

The National Foreign Trade Council, at its seventh annual meeting in New York, selected Cleveland, O., as the place at which to hold the Eighth National Foreign Trade Convention, scheduled for the spring of 1921. It was felt that as the 1920 Convention had met in San Francisco, the 1921 convention should be held in an inland city. Previous to the San Francisco meeting these gatherings had been held in Washington, D. C.; St. Louis, New Orleans, Pittsburgh, Cincinnati and Chicago.

Paterson, N. J., For Open Shop

The Associated Industries of Paterson, N. J., has gone on record as favoring the open-shop principle in the silk mills. An appropriation of $3,000 was voted for conducting a three months' educational campaign in Paterson in favor of the open shop.

Personals

E. P. WELLES, president of Chas. H. Besly & Co., Chicago, has returned from a three months' trip to Europe.

ROBERT G. BERRINGTON, for many years with the Cleveland Twist Drill Co., Cleveland, Ohio, has been appointed district sales manager in Cleveland, for the combined interests of the Reed-Prentice Co., of Worcester, Mass., the Whitcomb-Blaisdell Machine Tool Co., of Worcester, Mass., and the Becker Milling Machine Co., of Boston. The Cleveland office is located at 408 Frankfort St.

E. A. ORRELL, who has been connected with the Graton & Knight Manufacturing Co., Worcester, Mass., in the Boston sales office, has sailed recently for China, where he will pass the next two years introducing leather belting and goods to the trade.

GEORGE S. HAWLEY, who has been general manager of the Bridgeport Manufacturers' Association, of Bridgeport, Conn., has resigned his position to accept a place as vice-president and general manager of sales for the Bridgeport, Conn., Gas Light Co.

J. W. HAYES, who has been manager of the Philadelphia branch office, of the Graton & Knight Manufacturing Co., Worcester, Mass., has been transferred to the Boston office of the company.

DONALD MCSKIMMON has been made purchasing agent of the S. W. Card Manufacturing Co., division of the Union Twist Drill Co., Mansfield, Mass.

HENRY D. ROLPH, of the Yale & Towne Manufacturing Co., Stamford, Conn., has left for Vancouver, B. C., where he is to sail for Japan, on a business trip, carrying a full line of Yale products. From Japan, Mr. Rolph will go to China, French Indo-China, Siam, Dutch East Indies, Straits Settlements, Federated Malay States, etc. Mr. Rolph expects to be gone from this country for about two years.

A. A. LOEFFLER has recently been appointed by the Doehler Die-Casting Co. as its Detroit representative, succeeding F. C. SEEGER, who will now represent the company on the Pacific Coast, with headquarters in San Francisco.

L. W. CASH, purchasing agent for the Defiance Motor Truck Co., Defiance, Ohio, has severed connections with that company to take effect Oct. 1.

C. C. GRAY has severed his connections with the Farrar Advertising Co. to become manager of sales for the Pannier Brothers Stamp Co., Pittsburgh, Pa.

T. J. DAVIS, formerly representing the Union Twist Drill Co., Athol, Mass., in the states of Michigan, Illinois, Indiana, Wisconsin and Minnesota, has become connected with the W. L. Romaine Machinery Co., Milwaukee, Wis., as manager of the tool and equipment department.

JAMES R. COXEN, state director of vocational education, Laramie, Wyo., would like to get in touch with concerns willing to supply rough castings to be machined in the trade schools of Wyoming.

R. B. BENNETT, formerly connected with the Standard Steel and Bearings Corporation, Plainville, Conn., has been made mechanical superintendent of the Canadian General Electric Works, at Toronto.

F. H. SAWYER, manager at the Fall River, Mass., branch office of the Graton & Knight Manufacturing Co., leather belting manufacturer of Worcester, Mass., has been transferred to the Philadelphia sales office as manager of sales.

H. LEONARD RICHARDSON has been made resident engineer at the Birmingham, Ala., plant of the American Steel and Wire Co. Mr. Richardson was connected with the Worcester, Mass., plant for about four years in the capacity of mechanical engineer.

A. E. MURDOCK has been appointed assistant manager of the Hartford, Conn., plant (C) of the New Departure Manufacturing Co., Bristol, Conn. Mr. Murdock was formerly foreman in the tool department.

A. J. WEAVER, for nine and one-half years assistant superintendent of the Billings & Spencer Co., Hartford, Conn., manufacturer of drop forgings, machinists' tools, etc., has accepted the position of assistant chief inspector for the Pratt & Whitney Co., Hartford. Mr. Weaver left the latter to go to the former about ten years ago, and now goes back to the place where he started in as apprentice back in 1888.

FRED J. PASSINO, formerly assistant district manager of the New York territory of the Independent Pneumatic Tool Co., Chicago, Ill., has recently been appointed district manager at Pittsburgh, Pa.

R. A. BULL has resigned his position as vice president of the Duquesne Steel Foundy Co. and is now consulting metallurgist for the following steel foundries, grouped for the purpose of developing and perfecting higher standards in the production of steel castings: Electric Steel Co., Chicago, Ill.; Fort Pitt Steel Castings Co., McKeesport, Pa.; Isaac G. Johnson Co., Spuyten Duyvil, N. Y.; Lebanon Steel Foundry Co., Lebanon, Pa.; Michigan Steel Castings Co., Detroit, Mich.; Sivyer Steel Castings Co., Milwaukee, Wis.

C. G. BIGELOW has succeeded Ralph B. Dibble, as advertising manager of the Graton & Knight Manufacturing Co., Worcester, Mass.

EDWARD GROSSMAN, who has been connected with the Fairbanks Co., of New York, for a number of years and with other supply houses, is now associated with the T. P. Walls Tool & Supply Co., 25 Leonard St., New York City, in the capacity of treasurer and manager.

EDWARD CAVE has been made manager of the advertising department of the Yale & Towne Manufacturing Co. of Stamford, Conn., and has taken up his new duties.

CHARLES P. COOLEY, vice president and secretary of the Smyth Manufacturing Co., machinery manufacturer of Hartford, Conn., has been elected president of the Society for Savings Bank of Hartford, Conn., succeeding C. E. Gross, resigned.

E. KENT SWIFT, treasurer of the Whitin Machine Works, Whitinsville, Mass., will leave shortly on a European business trip.

Business Items

For the purpose of more closely cooperating with the industries of Indianapolis and vicinity the Norton Co. has opened a branch office for its grinding machine division at No. 304 Penway Building, 241 North Pennsylvania Ave., Indianapolis, Ind., under the direction of Walter F. Rogers, district representative. The establishment of this branch office will in no way affect the distribution of Norton grinding wheels. These will be handled as in the past by Vonnegut Hardware Co.

The Colonial Steel Co., Pittsburgh, Pa., has opened a warehouse in Cleveland, Ohio, and will hereafter carry its own stock of both high-speed and carbon tool steels. It will be represented in Cleveland by F. L. STEVENSON, manager, whose office will be at 1104 Prospect Ave.

The Ward Tool and Forging Co., of Latrobe, Pa., has arranged for representation in the State of Michigan and northern Ohio through John D. Scott, Inc. Associated with Mr. Scott is John E. Love. This new agency has opened offices at 1156 Penobscot Building, Detroit, Mich.

The Wickwire-Spencer Steel Corporation, of Worcester, Mass., and Buffalo, will hold its first annual sales convention at the company's office in Worcester, from Oct. 13 to 18. It will bring together sales representatives of the company from various parts of the country and a gala time and program is prepared for their entertainment, besides the talks, etc., regarding sales and other matters.

The United Manufacturing Co., Waterloo, Iowa, will change its headquarters from Waterloo to Belmond, Wright County, Iowa. Ernest F. Wege is chairman and Theodore Wege, secretary.

The New Advance Machinery Co., Van Wert, Ohio, has been incorporated at a capitalization of $100,000 and has purchased the plant and interests of the Advance Machinery Co. The company will conduct the business along modern lines, manufacturing a high grade line of band saws, wood shapers and glue room appliances.

The Hart Co., Inc., Williamsport, Pa., was recently capitalized at $100,000, to manufacture a complete line of valves, faucets, cocks, etc.

The Reed-Prentice Co., Becker Milling Machine Co. and Whitcomb-Blaisdell Machine Tool Co. combine has opened a branch office in Philadelphia under the management of G. S. Haven, who was formerly with Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. The new office is located at 514 Liberty Bldg., Philadelphia, Pa.

The business of the Luster Machinery Co. has been purchased by Fairbanks, Morse & Co., Boston, Mass., and will be known as one of its branch offices. E. J. Luster, president, and the staff of the Luster Machinery Co., have associated themselves with Fairbanks, Morse & Co. Mr. Luster will act as manager of the company's machine tool department.

The Whiting Foundry Equipment Co., Harvey, Ill., and the American Foundry Equipment Co., New York, have been consolidated under the name of the Whiting Corporation, and will be capitalized at $5,000,000. J. H. Whiting, president of the Whiting Foundry Equipment Co., becomes chairman of the board, and V. E. Minich, president of the American Foundry Equipment Co. will be president. The lines of manufacture of the two companies do not overlap; therefore it is the intention to maintain all present manufacturing facilities.

The Fairbanks-Morse Co., 30 Church St., New York, recently acquired the business of the Luster Machinery Co., of 917 Arch St., Philadelphia, and has established a branch office in that city. D. W. Dunn is the manager of the Philadelphia office and E. J. Luster has charge of the machine-tool business.

The Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently announced the following additions to its Pacific Coast sales departments: J. W. Ledgerwood, at Los Angeles; Zach D. Tallman, at San Francisco; Lloyd Finck, at San Francisco; and H. D. Jamieson, at Portland, Ore.

The name of Isbecque & Co. has been changed to Isbecque, Todd & Co.; there will be no change in the personnel of the organization. It has offices in New York, and Brussells, Belgium.

The Baush Machine Tool Co., Springfield, Mass., is completing a one-story and basement brick-and-steel addition and a three-story brick-and-concrete addition to its plant on Wason Ave., Springfield.

The Lancaster Steel Products Corporation, Lancaster, Pa., has recently opened a New York office, 25 West 43d St., in charge of L. E. Vesey, district sales manager.

The American Wire Die Co., Worcester, Mass., has recently been formed and has opened a shop at 12 Parker St., to make dies, etc.

The Kennedy Corporation, Baltimore, Md., incorporated with $2,000,000 capital stock, has acquired the plant of Fairbanks, Morse & Co. near its own plant, and also the entire capital stock of the Baltimore Malleable Iron and Steel Casting Co., which also adjoins the plant. The purchase price totals $1,850,000.

The Wisconsin Foundry and Steel Works, Cedar Grove, Wis., has been merged into the Cedar Grove Stove and Machine Co. The latter company was recently incorporated with a capital of $100,000. The new concern will occupy the quarters of the Wisconsin Foundry and Steel Works and will be under the management of P. M. Ketterhofen.

The Dwight P. Robinson & Co., Inc., New York, with which Westinghouse, Church, Kerr & Co., Inc. has recently consolidated, has established a new branch office in Youngstown, Ohio, in the Home Savings & Loan Building, in charge of C. I. Crippen. The company recently moved its Cleveland office from the Leader News Building to the Citizens Building.

Announcement has been made of the change in name of the Dale-Brewster Machinery Co. It will hereafter be known as the Dale Machinery Co., New York and Chicago.

Obituary

HOMER W. MEACHEM, prominent in the machinery manufacturing world, died at his home in Syracuse, N. Y., last week. Mr. Meachem was the organizer of the New Process Rawhide Co., and later of the Meachem Gear Corporation.

Forthcoming Meetings

The New York Section of the Illuminating Engineering Society will hold a joint meeting with the American Society of Safety Engineers at the Engineering Societies Building, New York, on Oct. 22.

The Buffalo Section of the A. S. M. E. will hold its October meeting on the twenty-sixth at the University Club. Non members are invited.

The American Gear Manufacturers Association will hold its semi-annual meeting at Lake Mohonk Mountain House, Mohonk Lake, Ulster County, N. Y., Oct. 27, 28 and 29.

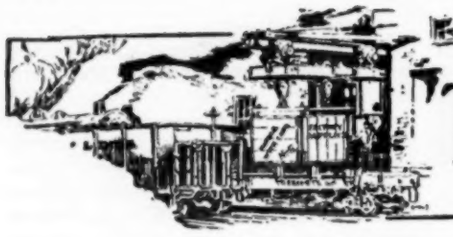
An exposition of U. S. manufacturers at Buenos Aires, Argentine Republic, S. A., has been arranged for the month beginning March 15, 1921. Information can be obtained from American National Exhibition, Inc., Bush Terminal Sales Building, 132 West 42nd St., New York.

The Federated American Engineering Societies will hold its first meeting at the Hotel New Willard, Washington, D. C., on Nov. 18 to 20 inclusive.

The National Machine Tool Builders' Association will hold its 19th annual Fall convention at the Hotel Astor, New York City, on Thursday and Friday, Dec. 2 and 3, 1920. C. Wood Walter, care of the association's offices at Worcester, Mass., is secretary.

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, 29 West 39th Street, New York City, from Dec. 7 to Dec. 10.

The Society of Automotive Engineers will hold its annual meeting on Jan. 11 to 13 inclusive at New York.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$46.50	$30.35
Northern Basic	51.30	27.55
Southern Ohio No. 2	48.50	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	57.12	32.40
Southern No. 2 (Silicon 2.25 to 2.75)	52.10	35.20
BIRMINGHAM		
No. 2 Foundry	42.00@45.00	29.25
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	51.25	29.00-30.00
Virginia No. 2	50.00*	33.10
Basic	51.00†	26.75
Grey Forge	48.00*	26.75
CHICAGO		
No. 2 Foundry local	47.00	26.75
No. 2 Foundry, Southern	48.67	28.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	49 56	28.15
Basic	48.96	27.15
Bessemer	51.96	29.35

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.30	$4.58	$3.47	$3.44	$3.37	$4.08	$3.47
Soft steel bars	4.50	4.73	3.37	4.50	3.27	3.98	3.37
Soft steel bar shapes	4.50	4.73	3.37	....	3.27	3.98	3.37
Soft steel bands	6.43	6.43	4.07	6.25	....	....	....
Plates, ¼ to 1 in. thick	4.75	4.78	3.67	3.64	3.57	4.28	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.77
Warehouse, New York	4.75	3.37
Warehouse, Cleveland	3.52	3.27
Warehouse, Chicago	4.12	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-7.00	7.23@8.00	4.57	6.75	7.13
No. 12	3.60-7.05	7.28@8.05	4.62	6.80	7.18
No. 14	3.65-7.10	7.33@8.10	4.67	7.35	7.23
No. 16	3.75-7.20	7.43@8.20	4.77	7.45	7.33
Black					
Nos. 18 and 20	4.20-6.20	8.41@9.80	5.30	8.30	7.90
Nos. 22 and 24	4.25-6.25	8.46@9.85	5.35	8.35	7.95
No. 26	4.30-6.30	8.51@9.90	5.40	8.40	8.00
No. 28	4.35-6.35	8.61@10.00	5.50	8.50	8.10
Galvanized					
No. 10	4.70-8.00	8.90@11.00	5.75	8.50	8.25
No. 12	4.80-8.10	9.00@11.00	5.85	8.60	8.30
No. 14	4.80-8.10	9.00@11.10	5.85	8.60	8.45
Nos. 18 and 20	5.10-8.40	9.25@11.40	6.15	8.90	8.75
Nos. 22 and 24	5.25-8.55	9.40@11.55	6.30	9.05	9.15
No. 26	5.40-8.70	9.55@11.70	6.45	9.20	9.30
No. 28	5.70-9.00	9.85@12.00	6.75	9.50	9.60

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.36	$5.90	$6.00
Flats, square and hexagons, per 100 lb. base	6.86	6.40	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

NICKEL AND MONEL METAL — Base prices in cents per pound F.O.B. Bayonne, N. J.

Nickel	
Ingot and shot	43
Electrolytic	45

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55

Special Nickel and Alloys	
Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, grades "A" and "C" (base)	72
Copper nickel ingots	42
Hot rolled copper nickel rods (base)	52
Manganese nickel hot rolled (base) rods "D" — low manganese	64
Manganese nickel hot rolled (base) rods "D"— high manganese	67

Domestic Welding Material (Swedish Analysis)—Welding wire in 100-lb lots sells as follows, f.o.b. New York: ⅛, 8½c. per lb.; ¼, 8c.; ⅜ to ½, 7½c Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.15
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	6.85
Hoop steel	6.68	6.50	5.43
Cold-rolled strip steel	12.50	8.25	11.00
Floor plates	6.91	6.00	6.88

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅜ to 3	54-57½%	41½-44%	⅜	15½-25½%	+1½-11½%
			½	19½-29½%	1½-11½%
			¾ to 1¼	24½-34½%	8 -18½%

LAP WELD

2	47 -50½%	34½-38%	1¼		
2½ to 6	50 -53½%	37½-41%	1½		
7 to 12	47 -50½%	33½-37%	2	20½-28½%	6½-14½%
13 to 14	37½-41 %		4½ to 6	22½-30½%	9½-17½%
15	35 -38½%		7 to 12	19½-27½%	6½-14½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅜ to 1¼	52 -55½%	39½-43%	¾ to 1¼	24½-34½%	9½-19½%
2 to 3	53 -56½%	40½-44%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45 -48½%	33½-37%	1¼		
2½ to 4	48 -51½%	36½-40%	1½		
4½ to 6	47 -50½%	35½-39%	2	21½-29½%	8½-16½%
7 to 8	43 -46½%	29½-33%	2½ to 4	23½-31½%	11½-19½%
9 to 12	38 -41½%	24½-28%	4½ to 6	22½-30½%	10½-18½%
			7 to 8	14½-22½%	2½-10½%
			9 to 12	9½-17½%	5½-+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
⅜ to 3 in. steel butt welded	38%	22%	39%	30%	54% 40%	40½@30 %
2½ to 6 in. steel lap welded	33%	18%	41%	26%	50@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 45%. Cast iron, standard sizes, plus 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	16.50	18.62	22.50
Tin in 5-ton lots	39.50	46.50	56.50
Lead	8.50	9.00	6.25
Zinc	8.50	8.50	7.60
ST. LOUIS			
Lead	8.00	8.00	6.00
Zinc	7.70@8.05	7.70@8.05	7.15

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

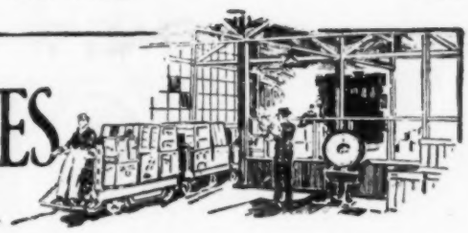
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	33.50	33.50	30.00	35.50	36.00	36.50
Copper wire (carload lots)	31.25	31.25	30.75	29.00	30.50	29.00	26.00
Brass sheets	28.50	28.50	32.00	36.00	33.00	27.00	28.00
Brass pipe	33.00	33.00	36.00	34.00	39.00	34.00	37.00
Solder (half and half) (case lots)	35.00	38.00	45.00	40.50	41.00	38.00	38.50

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	25.00	24.00
New York	27.00	28.00@29.75
Cleveland	27.00	29.00
Chicago	30.00	27.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 12.50

	Warehouse			
	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.30	12.50	14.70	13.00
New York	14.00	11.50	14.50	12.50
Chicago	14.50	16.50	14.95	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	7.25	9.50
Chicago	8.00	9.75
Cleveland	9.00	9.75

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	14.00	17.00	13.00	14.00
Copper, heavy, and wire	13.50	16.00	12.50	13.50
Copper, light, and bottoms	12.00	14.00	11.00	12.00
Lead, heavy	6.75	4.75	6.00	6.50
Lead, tea	4.50	3.75	4.00	5.50
Brass, heavy	7.00	10.50	9.00	14.00
Brass, light	6.00	7.50	6.00	7.00
No. 1 yellow brass turnings	7.00	10.00	7.00	7.50
Zinc	4.50	5.00	4.00	5.50

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	$33.00	$30.00	$33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	32.00
Chicago	29.00	31.00
Cleveland	34.00	35.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	90.00	54.00	70.00	50.00	60.00
Commercial	50.00	50.00	20.50	16.50	12.50	13.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+ $6.00	$1.50	List net	$2.25	+1.15	1.85
Hot pressed hexagon	+ 6.00	1.50	List net	2.25	+1.15	1.85
Cold punched hexagon	+ 6.00	1.50	List net	2.25	+1.15	1.30
Cold punched square	+ 6.00	1.50	List net	2.25	+1.15	1.30

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	40%	50%
Cleveland	50%	60-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+ 20%	25%	20%
Larger and longer up to 1¼ in. by 30 in.	+ 20%	25%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York ..... list Cleveland ..... $2.00 Chicago $1.90

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York ..... $7.00 Cleveland ..... $4.50 Chicago $5.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+ 20%	25%	10%
Larger and longer up to 1 in. by 30 in.	+ 20%	20%	5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	20%	10%	10%
Chicago	net	20%	net	20%
New York	25%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	List Net	40%	30%
Tinned	List Net	40%	30%

Boiler, ¾, ⅞, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York ..... $6.00 Chicago ..... $5.73 Pittsburgh $4.5

Structural, same sizes:

New York ..... $7.10 Chicago ..... $5.83 Pittsburgh $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	$34.00	$36.00	$35.00
Brass	33.00	36.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add .15-20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $12.50 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	— New York —			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	16.00	11.00 to 14.00
Colored mixed	9.00@14.00	9.00-12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.00-2.10	$2.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	3.00	2.50
Chicago	2.00	2.75	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40-3.90	$3.90	$3.65
Philadelphia	3.65	3.65	3.87
Chicago	4.10	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	October 18	October 11	October 4
Prompt furnace	$16.00@$16.50	$17.00@$18.00	$17.00@$18.00
Prompt foundry	17.00@18.50	18.00@20.00	18.00@20.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

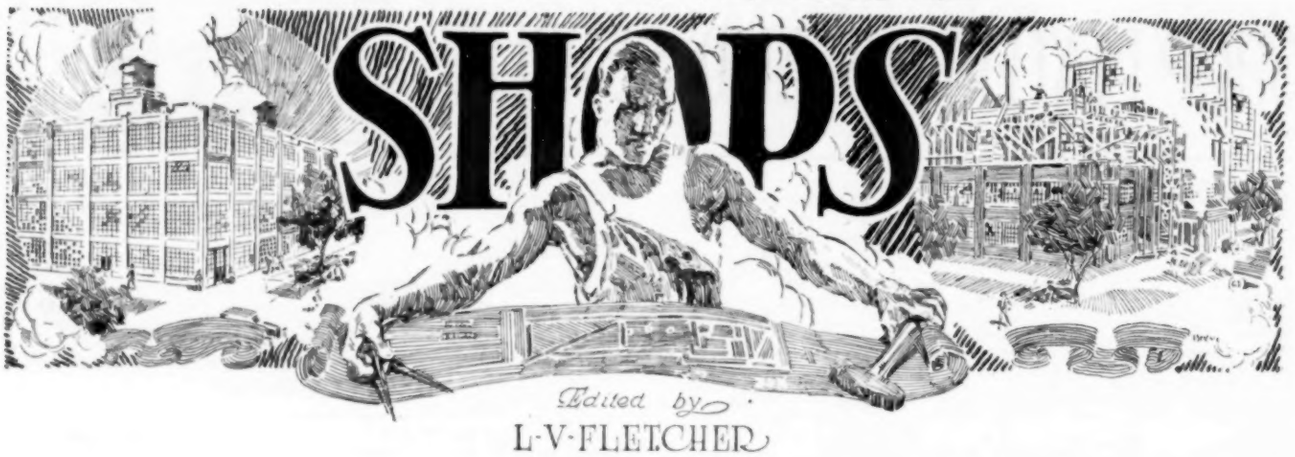
	—New York—		—Cleveland—		—Chicago—	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels, (5 bbl. lots	$1.15	$2.15	$1.45	$2.50	$1.25	$2.37
5-gal cans	1.35	2.30	1.65	2.75	1.50	2.57
1-gal cans (6 to case)	1.40	....	....	....	....	....

WHITE AND RED LEAD—Base price per pound:

	— Red —				— White —	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

NEW and ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

R. I., Providence—The Freeman Daughaday Co., 85 Sprague St., manufacturers of jewelry—one single action No. 3 Manville power press.

D. C., Washington — A. L. Flint, Genl. Purch. Agt. of the Panama Canal, Washington, D. C., will receive bids until Oct. 26 for furnishing the following tools—
One woodworking lathe, 20 in. x 12 ft. bed.
One 6 in. pipe cutting and threading machine.

N. J., New Brunswick—The Simplex Auto Co.—several lathes of various sizes.

N. Y., Eltingville (Staten Island P. O.)—Whitlock & Sons—one 14 in. pony planer.

Pa., Marcus Hook—The Lindsay Chaplet & Mfg. Co.—bolt cutters and threaders.

Pa., Philadelphia—The Engineering Gear Co., 430 Walnut St.—Fellows gear shaper.

Pa., Philadelphia — The Philadelphia Electric Co., 10th and Chestnut Sts.—general machine tools.

Pa., Titusville — The Oscillating Washer Co.—one gear cutter to cut 3 in. to 15¾ in. diameter with 5 and 6 pitch, one lathe, 24 in. swing, with cross feed (used).

Ga., Atlanta—The Southern Iron & Equipment Co., Grant Bldg.—machine tools, including locomotive wheel lathe, boring mill, punch, shear and small lathe, (new or used).

Tenn., Memphis — C. E. Brower & Co., Southern Express Bldg.—one 12 to 16 ft. x 24 to 26 in. engine lathe (new or used).

Va., Richmond — The Richmond Auto Shop, 5 North 18th St., W. W. Redford, Purch. Agt.—small lathe and drill press (new or used).

Miss., Lumberton — The Lumberton Saw Mfg. Co.—punches and surfacing machine for grinding circular saws 12 in. x 72 in. and a machine for putting bevel in teeth.

Ill., Chicago—The Bd. Educ., c/o Bureau of Purchases, 636 South Clark St., for Lane Technical School:
One 30 in. Queen City foot squaring shear.
One Du More tool post grinder.
One No. 9 Almond chuck drill.
One precision bench drill, 100 volt d.c. motor drive.
One double end grinder and buffer, similar to Willey No. 1 motor drive.
For Englewood High School:
One No. 1 milling machine, 60 cycle, 3 phase, 230 volt motor drive.
One No. 3 punch press.
One No. 10 screw cutting engine lathe, 4 ft. x 9 in. with compound rest and taper attachment.
One No. 2 Atlas arbor press.
One 36 in. foot squaring shear.
One W.S. combination wet and dry grinder with two 10 in. x 1½ in. alundum wheels and ½ hp., 115 volt, a.c motor drive.
One W.S. tool post grinder with internal and external grinding wheels and 110 volt. a.c. motor.
One No. 2 Marvel power back saw with 60 cycle, a.c. motor drive (all new).

Mich., Detroit—The Charcoal Iron Co. of America, R. F. Birchard, Purch. Agt.—one 3, 3½ or 4 ft. plain radial drill, belt drive (used).

Mich., Detroit—The Detroit Structural Steel Co., Newborn Ave. along tracks of Grand Ry.—equipment for fabricating steel.

Mich., Detroit—The Penberthy Injector Co., 346 Holden Ave.—miscellaneous machine tool equipment.

Mich., Detroit—Wolvering Tool & Die Wks., 50 Leverette St.—die making equipment.

O., Cleveland — The Brass Co., c/o A. Sogg, Archt., 319 Hippodrome Bldg.—½ ton crane, lathes, core ovens, revolving brass furnaces and moulding machines.

O., Cleveland—The Cleveland and Buffalo Transit Co., foot of East 9th St.—one lathe with full attachments, 24 in. swing, 10 ft. centers (used).

Wis., Kohler—The Kohler Co., manufacturer of plumbing fixtures, W. J. Kohler, Purch. Agt.—grinders.

Wis., Oconto—The Montana Tractor Co., G. Smith, Purch. Agt.—machine shop equipment.

Wis., Port Washington—The Turner Mfg. Co., W. A. Englehardt, Mgr.—boring mills, radial drills, milling machinery and automatic grinders.

Wis., Port Washington—The Turner Mfg. Co., manufacturer of gasoline engines, W. Engelhardt, Purch. Agt.—automatic grinders, milling machine and radial drill.

Wis., Prairie Du Sac—The Utility Hoist & Mfg. Co., 829 Forest Home Ave., Milwaukee—millers, shaper, planer, lathe and drill press.

Col., Denver—H. W. Baum Co., 201 Barclay Blk. (machinery for industrial sugar factory)—
One 16 ft. x 20 in. quick change lathe.
One 12 ft. x 14 in. quick change lathe.
One 16 in. heavy duty crank shaper
One 24 in. planing mill.
Two No. 534 Buffalo post drills.
One power back saw.
One 8 in. pipe machine.
One 1½ in. Williams bolt and pipe machines (all new).

Mo., St. Louis—The St. Louis and San Francisco Ry., 120 Bway., New York City—one horizontal motor driven boring machine, distance from top of plater to center of bar 36 in., spindle diameter not less than 4 in., distance between housings 6 ft. 6 in. or 7 ft., not less than 48 in. cross feed of table, table to be 3 ft. 6 in. or more in width and 5 ft. long.

Machinery Wanted

Va., Norfolk — The Republic Creosoting Co., C. F. Shuford, Purch. Agt.—grinding outfit, re-saw and small molder.

Ill., Chicago — The Ackerman Panel & Cabinet Co., 1916 Larrabee St., M. Ackerman, Purch. Agt.—double spindle shaper.

Ill., Chicago—The Go Toy Co., 1228 North Wells St.—one 36 in. band saw.

Ill., Chicago—The Webster Mfg. Co., 332 South Michigan St.—one profiling machine, die block 2 in. thick, working surface of table 12 in. x 12 in.

O., Columbus — R. H. Schryner, South High St., manufacturer of auto bodies, F. A. Miller, Genl. Mgr. — woodworking machinery including 3 shapers, 2 band saws, etc.

Wis., Elroy—R. O. Steffen—woodworking machinery.

Wis., Milwaukee—The Milwaukee Box Toe Co., 140 Reed St., F. E. Wagner, Purch. Agt.—stamping machine for the manufacture of felt box toes for shoes.

Wis., Milwaukee—The Modern Portable Co., 449 7th Ave., manufacturer of portable gages, W. Steinmetz, Purch. Agt.—one 7 in. to 9 in. sticker for woodworking.

Wis., Sheboygan — The Sheboygan Dairy Products Co.—ice machines, mixers, etc., for its New London plant.

Wis., Tomahawk — E. Hoenisch Co. — woodworking machinery to manufacture potato crates and lathes.

Ont., Ottawa—Dey Bros., Laurier Ave., W. — machinery for manufacturing and maintaining artificial ice surface for a proposed rink.

Metal Working

NEW ENGLAND STATES

Conn., Ansonia—The Amer. Brass Co., 58 Liberty St., will build a 1 story, 340 x 400 ft. mill for the manufacture of copper wire. Estimated cost, $725,000. Noted Oct. 14.

Conn., Waterbury—S. Rosenbaum, 39 Spring St., has awarded the contract for the construction of a 3 story garage, etc., on Spring St. Cost to exceed $25,000.

Mass., Fitchburg—The Fitchburg Gas & Electric Light Co., 537 Main St., has awarded the contract for the construction of a 2 and 3 story, 58 x 152 ft machine shop, service building and boiler house, on Sawyer Passageway. Estimated cost, $125,000.

Mass., Lynn—The General Electric Co., 84 State St., will soon award the contract for the construction of a 1 story, 160 x 300 ft. addition to its factory for the manufacture of electrical supplies. Estimated cost, $150,000.

Mass., Salem—Rodman & Cashion, 122 Boston St., plan to build a 1 story garage on Boston St. Estimated cost, $10,000. Private plans.

Mass., South Boston (Boston P. O.)—The Hersey Mfg. Co., 314 West 2nd St., manufacturer of special machinery, has awarded the contract for altering its plant. Estimated cost, $20,000.

Mass., Turners Falls—The Montague Machine Co., 2 Ave. A, has awarded the contract for the construction of a 1 story machine shop on 15th St. Estimated cost, $125,000.

Mass., Westfield—The Vitrified Wheel Co. will soon award the contract for the construction of a 2 story, 60 x 102 ft. kiln building on Emery St. Estimated cost, $30,000. F. E Chamberlain, 390 Main St., Worcester, Archt.

Mass., Whitinsville—The Whitins Machine Wks. will build a 5 story, 90 x 400 ft. addition to its plant. Estimated cost, $500,000. Noted July 29.

Mass., Worcester—The Claflin Summer Coal Co., 9 Pleasant St., has awarded the contract for the construction of a 1 and 2 story, 28 x 154 ft. garage on Southbridge St. Estimated cost, $35,000.

N. H., Nashua—The Improved Paper Machinery Co., Burke St., has awarded the contract for the construction of a 3 story addition to its factory. Estimated cost, $24,000.

R. I., Pawtucket—The Collyer Insulated Wire Co., 249 North Main St., has awarded the contract for altering its plant on North Main St. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Crystal Ice Co., Chester St. and North Ave., is having plans prepared for the construction of a 2 story, 80 x 80 ft. garage. Estimated cost, $30,000. G. F. Whiting, Pres. R. L. Harris, 1133 Calvert Bldg., Archt.

N. J., Florence—The Florence Fdry. Co. will soon award the contract for the construction of a 2 story, 50 x 100 ft. factory. Estimated cost, $50,000. J. W. Levin, Liberty Bldg., Philadelphia, Pa., Archt.

N. Y., Buffalo—The Peugeot Co. of America, Colgate and Hopkins Sts., has had plans prepared for the construction of a 1 story, 120 x 460 ft. automobile manufacturing plant. Estimated cost, $125,000. D. W. Healy, Iroquois Hotel, Engr.

N. Y., East Syracuse — Chapin & Baker Mfg. Co., Edison St., Syracuse, plans to construct 1 story, 66 x 180 ft., 1 story, 40 x 98 ft. and a 1 story, 40 x 60 ft. building on Manlius St. here for the manufacture of gears. Estimated cost, $150,000.

N. Y., New York (Borough of Brooklyn) —J. P. Kelley, c/o Carlson & Wiseman, Archts., 226 Henry St., will build a 1 story, 130 x 190 ft. garage on East 16th St. near Kings Highway. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn) —M. Klein, 783 Nostrand Ave., will build a 1 story, 75 x 100 ft. garage on Stockholm St. near Central Ave. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn) —G. Nardello, c/o W. C. Winters, Archt. and Engr., 106 Van Siclen Ave., will build a 1 story, 115 x 140 ft. garage on Fulton St. Estimated cost, $90,000.

N. Y., New York (Borough of Manhattan)—Calabro Bldg. Co., c/o DeRose & Bavalier, Archts., 370 West 149th St., will build a 1 story, 50 x 100 ft. garage on Melrose Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Manhattan)—City Real Estate Co., 176 Bway., will build a 1 story, 75 x 200 ft. garage on Boston Rd. near Jefferson Pl. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—J. P. Kelley, c/o Carlson & Wiseman, Archts., 226 Henry St., Brooklyn, will build a 4 story, 50 x 100 ft. garage at 521 West 161st St. Estimated cost, $100,000.

N. Y., New York (Borough of Manhattan)—P. F. Kane, 417 East 46th St., will build a 1 story, 100 x 125 ft. garage at 502 East 80th St. Estimated cost, $35,000.

N. Y., Rosebank (Staten Island P. O.)— L. A. Dreyfuss has awarded the contract for the construction of a 2 story garage, etc.

N. Y., Syracuse — W. D. Andrews, 216 East Washington St., has awarded the contract for the construction of a 2 story, 91 x 217 ft. garage at 617 West Genessee St. Estimated cost, $50,000.

Pa., Kensington (Philadelphia P. O.)— A. Taylor & Co., c/o G. S. Idell, Archt., 1705 Chestnut St., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory on Cedar and Verango Sts. for the manufacture of steel wire.

Pa., Morrisville—C. A. Pidcock, 11 South Warren St., Trenton, N. J., plans to build a garage and machine shop, on Bridge St., here Estimated cost, $30,000.

Pa., Philadelphia—S. C. Durrel, c/o L. B. Rothchild, Archt., 1225 Sanson St., plans to build a 1 story, 37 x 115 ft. garage on Park St. and Hunting Park. Estimated cost, $10,000.

Pa., Philadelphia—J. C. Ulick, c/o Clark & Dudnick, Archts, Drexel Bldg., will soon award the contract for the construction of a 1 story, 110 x 170 ft. garage on 33rd, Columbia and Natrona Sts.

Pa., Philadelphia—Whitney McDonald Co., 2320 East Tioga St., has awarded the contract for altering its 2 story pipe factory on Tioga and Memphis Sts. Estimated cost, $10,000.

Pa., Warren — The Struthers Wells Co. will soon award the contract for the construction of a 1½ story, 68 x 140 ft. forge shop and a 40 x 86 ft. boiler house. Estimated cost, $100,000. Private plans.

MIDDLE WEST

Ill., Chicago—The Gardner Wire Co., 520 North Parkside Ave., has awarded the contract for the construction of a 1 story, 25 x 25 ft. factory. Estimated cost, $10,000.

Mich., Detroit—The Detroit Evening News, Lafayette Blvd., plans to build a 1 story, 90 x 140 ft. garage. A Kahn, Marquette Bldg., Archt.

Mich., Detroit—Kessler & Sons, c/o S. E. Remey, Archt., Whitney Bldg., plan to build a 1 story, 30 x 150 ft. garage on Dix Ave. Estimated cost, $10,000.

O., Bucyrus—The Ohio Crane Co. has awarded the contract for the construction of a 2 story, 100 x 127 ft. factory. Estimated cost, $75,000.

O., Cleveland—The Brass Co., c/o A. Sogg, Archt., 319 Hippodrome Bldg., is having plans prepared for the construction of a 1 story, 75 x 160 ft. foundry and machine shop. Estimated cost, $100,000.

O., Cleveland — St. Hyacinths Church, East 61st St. and Francis Ave., will soon award the contract for the construction of a 40 x 83 ft. boiler house and garage. Estimated cost, $60,000. W. C. Jansen, 402 Electric Bldg., Engr.

O., Columbiana—The Columbiana Boiler Wks. has awarded the contract for the construction of a 1 and 2 story addition to its factory. Estimated cost, $50,000.

O., Conneaut—The Conneaut Telephone Co. is having plans prepared for the construction of a 2 story, 40 x 80 ft. and 40 x 40 ft. telephone exchange and garage. Estimated cost, $100,000. V. Redding, 301 Bird Bldg., Mansfield, Archt.

O., Elyria—The Universal Crane Co., 1106 Swetland Bldg., Cleveland, has awarded the contract for the construction of a 1 story, 118 x 180 ft. factory. Estimated cost, $125,000.

O., Fremont—The Henkel-Clauss Cutlery Co. has awarded the contract for the construction of a 2 story, 125 x 187 ft. factory. Estimated cost, $100,000.

Wis., Cudahy—The Worthington Pump & Mchy. Co., Packard Ave., has awarded the contract for the construction of a 2 story, 60 x 175 ft. pattern shop and storage room. Estimated cost, $130,000. Noted Aug. 12.

Wis., Milwaukee—The Wisconsin Food Products Co., Port Washington Rd., has awarded the contract for the construction of a 1 story, 60 x 200 ft. garage. Noted Sept. 16.

Wis., Milwaukee—The Wisconsin Telephone Co., 418 Bway., will soon award the contract for the construction of a 1 story, 120 x 130 ft. garage on Clybourn St. A. C. Eschweiler, Goldsmith Bldg., Archt.

Wis., Oconto — The Montana Tractor Co. has awarded the contract for the construction of a 1 story, 150 x 200 ft. tractor factory on Main St. to include a machine shop. Estimated cost, $150,000.

Wis., Port Washington—The Turner Mfg. Co. will soon award the contract for the construction of a 1 story, 60 x 180 ft. foundry, machine shop, etc., on Main St. Estimated cost, $150,000. W. A. Englehardt, Mgr. F. D. Chase, Inc., Michigan Ave., Chicago. Archt. and Engr.

Wis., Sheboygan — The Optenberg Iron Wks., 7th St. and Clara Ave., plans to build a 1½ story, 40 x 100 ft. machine and blacksmith shop on Clara Ave. Estimated cost, $100,000. Architect not selected.

Wis., Sheboygan—H. M. Schmidt, 1826 North 7th St., has purchased a site on Jefferson and 8th Sts., and plans to build a 3 story, 72 x 110 ft. garage. Estimated cost, $100,000. Architect not selected.

Wis., Sheboygan—Sheboygan County has awarded the contract for the construction of a 1 story, 40 x 120 ft. repair shop.

WEST OF MISSISSIPPI STATES

Iowa, Davenport—The Western States Portland Cement Co. is building the first unit of its plant at Nutting Station near here, to include a store room and machine shop. Total estimated cost, $2,000,000.

Ia., Marshalltown — The Victor Heating Co., manufacturer of heaters and heating equipment, plans to construct an addition to its present building, to cover 48,000 sq. ft. floor space.

CANADA

Man., Winnipeg — The Manitoba Motor Cars, Ltd., 505 Great West Permanent Bldg., plans to build a 2 story, 50 x 150 ft. auto assembling plant on Academy Rd. and Lindsay St. Estimated cost, $70,000. F. H. P. Parr, 202 Belgia Bldg., Archt and Engr.

Ont., Collingwood—The Imperial Steel & Wire Co., Hurontario St., has awarded the contract for the construction of a 3 story nail and wire factory. Estimated cost, $150,000.

Ont., London—The Service Motor Truck Co., Wabash, Ind., plans to build a plant on Chelsea Green here for the manufacture of malleable iron castings. Estimated cost, $150,000.

Ont., Niagara Falls — The Oneida Community Co., Niagara Falls, N. Y., plans to construct 3 factory buildings here for the manufacture of steel game traps.

Ont., Toronto — The Anthes Fdry. Co., Ltd., 64 Jefferson Ave., has awarded the contract for the construction of a 1 story foundry. Estimated cost, $20,000.

Ont., Watford—The Andrews Wire Wks. of Canada, Ltd., plans to enlarge its plant.

Ont., Welland—The J. Deere Mfg. Co., Welland Jct., has awarded the contract for the construction of a dry kiln and a factory for the manufacture of farm machinery. Estimated cost, $50,000.

Ont., Whitby—The Mauson Motor Co. has purchased a site and plans to build a plant.

Que., Montreal—The Downtown Garage, Ltd., 63 Prince St., plans to build a garage. Estimated cost, $100,000.

Sask., Elbow—I. Todd will soon award the contract for the construction of a 2 story, 40 x 80 ft. garage. Estimated cost, $50,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Bridgeport—The Huber Ice Cream Co., 800 Seaview Ave., has awarded the contract for the construction of a 2 story addition to its plant on Seaview Ave. Estimated cost, $30,000. Noted Oct. 14.

Conn., Hartford—The Peoples Dairy Co., 50 Dean St., has awarded the contract for the construction of a 1 story, 33 x 60 ft. addition to its dairy plant on Dean St. Estimated cost, $12,000. Noted Sept. 16.

Conn., Hartford—The Travelers Insurance Co., 700 Main St., plans to build a printing plant on Albany Ave. Estimated cost, $100,000.

Conn., New Haven — The New Haven Pulp & Board Co., Green and East Sts., plans to build a 2 story addition to its factory. Estimated cost, $50,000. Fletcher Thompson, Inc., 1087 Broad St., Bridgeport, Engrs.

Me., Fairfield — The Keyes Fibre Co., Waterville, has awarded the contract for the construction of a 1 and 2 story pulp mill. Estimated cost, $125,000.

Me., Great Works—The Penobscot Chemical Fibre Co., 49 Federal St., Boston, Mass., has awarded the contract for the construction of a 34 x 45 x 109 ft. addition to its plant. Estimated cost, $125,000.

Me., Portland—The Natl. Biscuit Co., 93 Chestnut St., has awarded the contract for the construction of a 1 story, 60 x 112 ft. addition to its plant. Estimated cost, $25,000. Noted Oct. 14.

Mass., Fitchburg—The Falulah Paper Co., Falulah Rd., has awarded the contract for the construction of a 1 story, 40 x 100 ft. addition to its paper factory. Estimated cost, $25,000.

Mass., Somerville—The New England Breakfast Food Co., 29 Newberne St., will build a 3 story, 45 x 85 ft. addition to its plant on Lowell St. Estimated cost, $50,000.

Mass., Worcester—M. J. Whittall, Brussels St., manufacturer of carpets, has awarded the contract for the construction of a 1 story, 83 x 202 ft. weave shed on Southbridge St. Estimated cost, $125,000.

N. H., Manchester—The Kimball Bros. Shoe Co., Massabesic St., plans to build an addition to its factory on Cypress and Jewett Sts.

R. I., Pawtucket—J. K. Bateman, 17 Dexter St., is building a 3 story, 50 x 100 ft. cold storage plant. Estimated cost, $125,000.

R. I., Providence—The Revere Rubber Co., 355 Valley St., has awarded the contract for the construction of a 3 story addition to its rubber factory on Valley and Hemlock Sts. Estimated cost, $50,000.

R. I., Providence—The Vesta Knitting Mills, 4 Blount St., manufacturer of underwear, has awarded the contract for the construction of a 6 story addition to its plant. Cost to exceed $50,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Amer. Ice Co., Calvert Bldg., has awarded the contract for the construction of a 33 x 82 x 99 ft. ice storage building, 82 ft. high, on Montford Ave. near Chase St. Estimated cost, $200,000.

N. J., Trenton—The New Jersey Tile Co., Muirheid Ave., plans to build a 1 story, 60 x 200 ft. tile plant, to include 3 kilns, press room, slip house, etc., on Brunswick St. Estimated cost, $30,000. Karno-Smith Co., Broad St. Bank Bldg., Engrs.

N. Y., Amsterdam—S. Sanford & Sons Inc., manufacturers of rugs and carpets, is building a 6 story, 60 x 85 x 120 ft. storehouse, a 6 story, 80 x 100 x 352 ft. mill building and a 2 story, 65 x 65 x 85 ft. boiler house.

N. Y., New York (Borough of Brooklyn)—The Amer. Marine Paint Co Inc., 175 Dwight St., will build a 2 story factory for the manufacture of paint, on Richards St. Estimated cost, $75,000.

Pa., Bethlehem—The Traveler Rubber Co. plans to build a 1 story, 25 x 35 ft. pumping station and a 20 x 30 ft. cement house. Estimated cost, $10,000. J. O. Hunt, 114 North Montgomery St., Trenton, N. J., Archt.

Pa., Cresson—The Penn Cress Ice Cream Co. is having plans prepared for the construction of a 2 story, 50 x 90 ft. ice cream plant. Estimated cost, $50,000. McCormick Co., Century Bldg., Pittsburgh, Engr.

Pa., Philadelphia—The Staybestos Mfg. Co., Linn and Armat Sts., has awarded the contract for the construction of a 2 story, 60 x 150 ft. factory on Berkley St. and Germantown Ave. for the manufacture of asbestos. Estimated cost, $75,000.

Pa., Royalton—The Vogt Farm Meat Products Co. is having surveys made by I. J. Boyd, Middletown, for a 2 story, 60 x 200 ft. factory on Youngs Lane here to include a warehouse, stock yard, buildings, etc. Estimated cost, $150,000.

SOUTHERN STATES

S. C., Union—The City Gas Co. plans to build a gas plant. Estimated cost, $150,000. T. McNally, Pres.

MIDDLE WEST

Ind., Indianapolis—The Westinghouse Lamp Co., 165 Bway., New York City, has awarded the contract for the construction of a plant here, for the manufacture of incandescent lamps, etc. Estimated cost, $500,000. Noted Sept. 9.

Mich., Center Line—A. Kraemer plans to build a 3 story, 63 x 190 ft. junior high school, to include a manual training department. Van Leyen, Schilling, Keough & Reynolds, 556 Cass Ave., Detroit, Archts.

Mich., Hantramck (Detroit P. O.)—The Jeffery Dewitt Co., Butler Ave. along the tracks of the Grand Trunk Ry., Detroit, plans to build a 5 story addition to its factory on Butler Ave. here for the manufacture of porcelain ware. Estimated cost, $200,000.

O., Cleveland—The Cleveland Grain Co., Engineers Bldg., plans to build a 1 story mill and elevator. Estimated cost, $150,000. A. E. Baxter Eng. Co., Elliott Sq., Buffalo, N. Y., Engr.

O., Cleveland—D. D. Wessels, 1385 East 17th St., manufacturer of concrete tubs, will soon award the contract for the construction of a 2 story, 107 x 116 ft. factory on East 21st St. and Oregon Ave. Estimated cost, $100,000. W. S. Caldwell, Park Bldg., Archt. Noted July 8.

Wis., Kenosha—The Morse Granite Co. has awarded the contract for the construction of a 1 story, 45 x 50 ft. work shop. Estimated cost, $20,000.

Wis., Milwaukee—P. Bogenski, 1139 Grove St. plans to build a 1 story, 70 x 172 ft. factory to manufacture waterproof cement brick. Private plans.

Wis., Milwaukee—The Red Star Yeast & Product Co., 27th and St. Paul Sts., will soon award the contract for the construction of a 2 story, 30 x 96 ft. yeast house. Estimated cost, $25,000. E. R. Liebert, University Bldg., Archt. and Engr. Noted Oct. 7.

Wis., Random Lake—E. Fischer has awarded the contract for the construction of a 2 story, 60 x 152 ft. cheese and dairy products factory on Main St. Estimated cost, $50,000.

Wis., Rice Lake—The Rice Lake Excelsior Co. has awarded the contract for the construction of a 3 story, 60 x 75 ft. excelsior factory on Main St. Estimated cost, $30,000. F. Gardner, Mgr.

Wis., Sheboygan—The Ke-No Co., 1639 Calumet St., plans to build a 3 story, 60 x 150 ft. factory for the manufacture of furniture novelties. Estimated cost, $40,000.

Wis., Two Rivers—The Two Rivers Millwork & Cabinet Co. plans to construct a 2 story, 60 x 150 ft. cabinet manufacturing building on 17th and Monroe Sts. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Col., Sterling—The Great Western Sugar Co., Sugar Bldg., Denver, will build a sugar factory near here to have 1,200 ton capacity. Estimated cost, $2,000,000.

Ia., Cedar Rapids—The Concrete Products Co. has awarded the contract for the construction of a 2 story factory and office building. Estimated cost, $60,000.

Minn., Hackensack—Cass County School Dist. (Walker) will soon award the contract for the construction of a 2 story, 102 x 107 ft. grade school here to include a manual training department. Estimated cost, $100,000. Lickenberg, Kaplan & Martin, 617 Enright Bldg., Minneapolis, Archts. and Engrs.

N. D., Minot—The Minot Steam Laundry has awarded the contract for the construction of a 2 story, 87 x 140 ft. steam laundry. Estimated cost, $45,721

Tex., Dallas—A. Marshall, Oklahoma City, Okla., is having plans prepared for the construction of an ice cream factory, milk handling station and cold storage house on Kentucky St. here. Estimated cost, $100,000.

Tex., Dallas—The Trinity Paper Mills, 401 Marvin Bldg., plans to build a plant for the manufacture of paper pulp from cotton seed linters.

Tex., Gonzales—F. E. Shuler Grain Co. is having plans prepared for the construction of a grain elevator, grist mill, corn sheller and shuck baling plant. Estimated cost, $50,000.

CANADA

N. S., Stewiache—Dickie & Co., Ltd., plans to rebuild its lumber mills which were recently destroyed by fire. Loss $150,000.

N. S., Sydney—The Dominion Iron & Steel Co. will soon award the contract for the construction of a brick-making plant.

Ont., Midland—The Copeland Flour Mills, Midland Ave., has awarded the contract for the construction of a 7 story, 100 x 170 ft. flour mill. Estimated cost, $365,000. Noted Sept. 9.

Ont., Port Arthur—The Provincial Paper Mills, Ltd., Toronto, has purchased the Port Arthur Pulp and Paper Co. here and plans to expend $1,000,000 to improve and build addition to same.

Ont., St. Thomas—The Canadian Edison Phonographs, Ltd., has purchased a large factory and plans to remodel and equip same for its own use. Estimated cost, $250,000. O. J. Haarlander, Mgr.

Ont., Toronto—Cridland & Sons, 1450 Gerrard St., plan to build a 2 story meat packing and bacon curing factory. Estimated cost, $40,000.

Ont., Toronto—The Welland Automobile Storage Battery Co., East 131st St. and Clair Ave., Cleveland, O., has purchased a 3 acre site on Wetshire Ave. here and plans to build a storage battery plant. Estimated cost, $500,000.

Que., Clarke—The Clarke Trading Co., Ltd., will soon award the contract for the construction of a pulp and paper plant. Estimated cost, $500,000.

Que., Matane—The Hammer Mill Paper Co. of Erie, Pa., plans to build a mill here.

Que., Montreal—The Sherwin Williams Co., Ltd., Centre St., has awarded the contract for the construction of a 3 story addition to its paint plant. Estimated cost, $62,000.

FOREIGN

India, Singapore—The Gutta Percha Co., Holland, has awarded the contract for the construction of a 2 story, 80 x 400 ft. tire plant here. Estimated cost, $300,000.

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